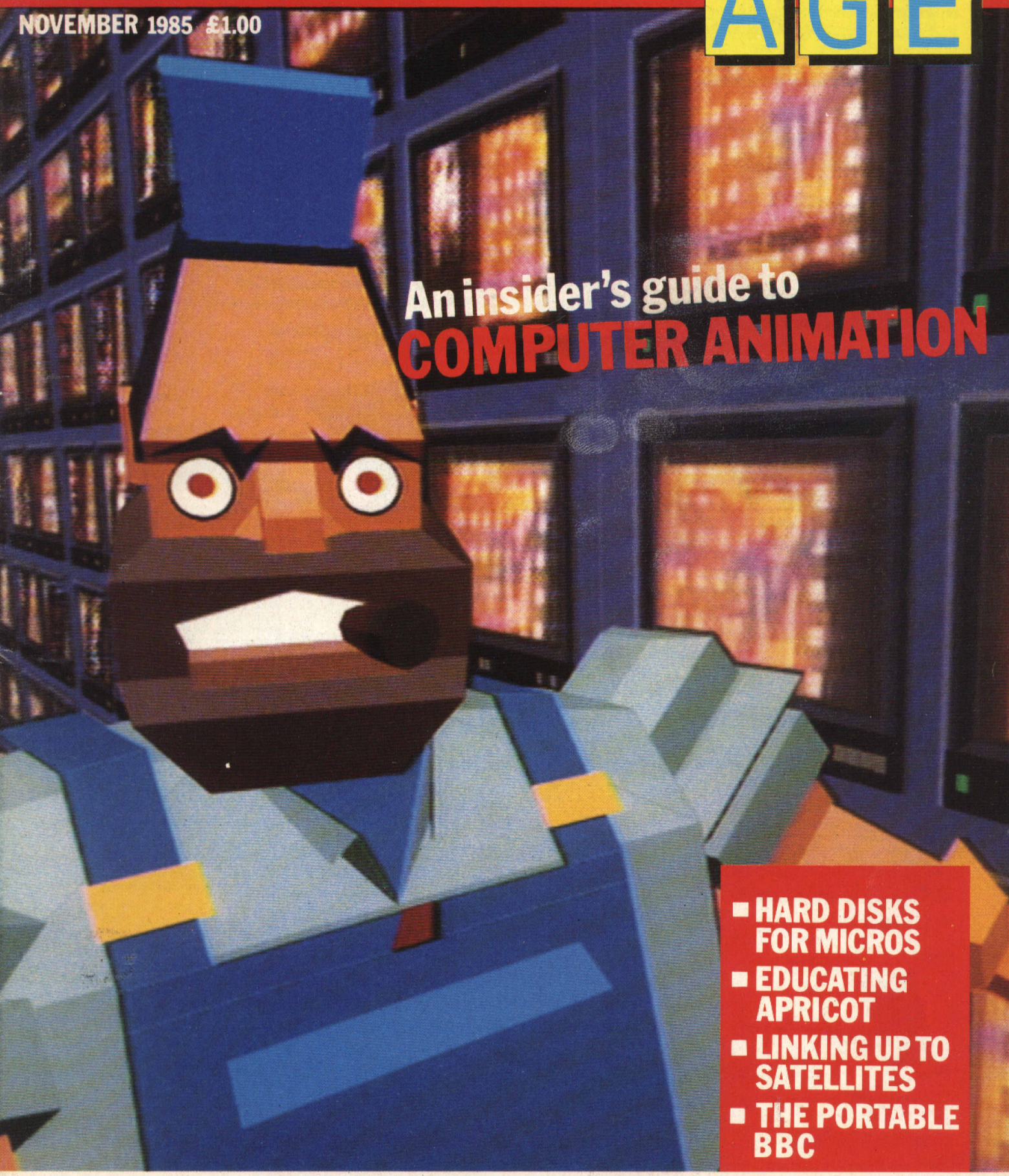
COMPUTING AGE

NOVEMBER 1985 £1.00



An insider's guide to COMPUTER ANIMATION

- HARD DISKS FOR MICROS
- EDUCATING APRICOT
- LINKING UP TO SATELLITES
- THE PORTABLE BBC

MAKING MORE OF YOUR COMPUTER

AN EMAP PUBLICATION USA $2.95 GERMANY D6.50 SINGAPORE S$4.95

Front Cover: Still from Dire Strait's video for their "money for nothing" single. Directed by Steve Barrow for Limelight. Graphics by Rushes Post Production.

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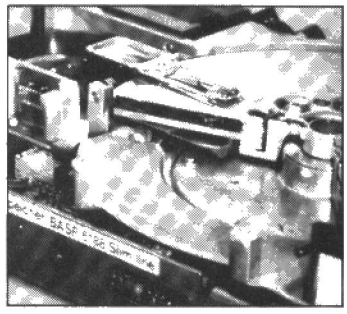
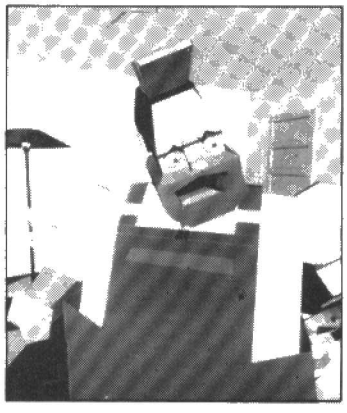


20 The technology behind hard disks explained.



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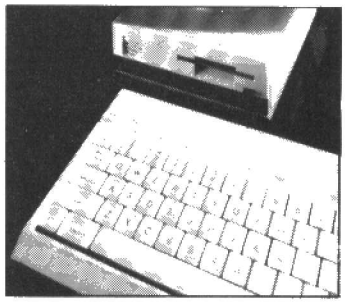

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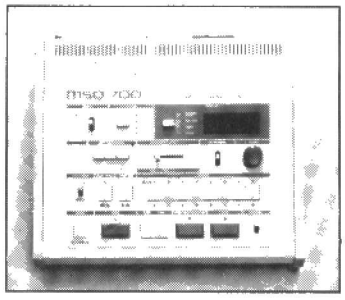


50 Making music with your micro with help from MIDI.

Commitment to comms

The role of micro computers in communications systems will form an integral part of the editorial coverage of *Computing Age* in the coming months. As part of our commitment to the belief in services such as Prestel and Telecom Gold, *Computing Age* has arranged for mailboxes on these systems and is looking at the possibility of subscribing to other similar operations.

Telecom Gold is an ideal medium for the transmission and reception of ASCII text files – we have used the system to receive articles from authors and, given the vagaries of the postal service and the inflexibility of magazine deadlines, plan to extend this application of Gold in the future. The service offers local call access in the London area at a variety of baud rates, including 300/300 and 1200/75. Users in other parts of the country can access Gold via the PSS system, again at a range of baud rates. This, coupled with the fact that Gold operates on standard ASCII characters, means that the service is readily accessible to many micro owners. The charges made for Gold may be a little high if it is to be used for purely recreational purposes, but for those with a professional need to exchange moderate amounts of text based information a registration to Gold can easily be justified on grounds of cost and convenience.

The Prestel/Micronet 800 service will be better known to many readers of *Computing Age*. The magazine has recently arranged to become a sub-IP to Micronet 800. This in effect means that *Computing Age* will initially have editorial control over some 40 frames of information with the option of increasing this to 100 in the future. The updating of the *Computing Age* frames will be done by staff of the magazine with the aid of a BBC micro and a suite of Prestel editing software. The frames allocated to *Computing Age* will be used for a variety of purposes – from updating issues raised in the current issue of the magazine to keeping readers informed of the content of forthcoming attractions. Our sub-IP area within Micronet will also allow readers to send us mailbox messages which, under normal circumstances, we will be able to respond to within 24 hours.

Details of the contact points for both Telecom Gold and Micronet 800 are shown on the contents page – we look forward to receiving readers' reactions to *Computing Age* via electronic mail in the near future.

NEXT MONTH

520ST software in action

The new products pages of this issue list some of the many ST programs launched at the PCW show. By next month we hope to have evaluated production versions of some of the more interesting of these releases.

Printing in colour

While it is taken for granted that the video output of a micro will be in colour, when it comes to print out, black and what is still the order of the day – until recently that is. The advent of low cost colour printers brings a multi-colour hard copy capability within the reach of micro owners operating on a budget. Next month we survey some of the best buys in colour printers.

Computer crime

With profits conservatively estimated at £195 million, crime is an important and often overlooked growth sector in the computer industry. We trace its history from minor embezzlements to massive swindles and discover why it is that the victims often keep a lower profile than the perpetrators.

The advantages of CP/M plus

CP/M plus is designed to facilitate the use of the bank switched RAM found in 128K eight bit micros. The revised version of the operating system offers many more advantages over its predecessor though.

ON SALE NOVEMBER 13

Content subject to late revision

In preparing this item there is a considerable danger that we will be overtaken by events. At the time of writing, the end of September, it has just been confirmed that the 128K version of the Spectrum, code named the Derby, will be on sale in Spain before the end of this year.

Sinclair, however, continues to deny that the new machine will be marketed in the UK until the start of 1986. The official line is that, as both the Spectrum Plus and the now sub £200 QL are selling so well (remember, these are Sinclair's words) there is no need to introduce the Derby to the UK in the near future.

Indeed, if the price announced for the Spanish version of the computer is translated into pounds, the 128K Spectrum would cost about the same as the QL. It would obviously make no sense for Sinclair to market two computers so radically different in technical specification at the same price. Having come to this conclusion, the guessing game can begin.

Firstly, it is not unheard of for a computer manufacturer to hotly deny plans to launch a computer one day only to officially launch it the next – remember Amstrad and the CPC6128? Assuming then that it is possible that Sinclair could bring the Derby to the UK in the near future, the question is what implications would this have on their present marketing plans.

Unlike times gone by, Sinclair's options are limited by the Dixons deal. Any moves on Sinclair's behalf would almost certainly have to be approved, unofficially or not, by Dixons' management. Another factor to take into account are the stock levels of the QL and Spectrum Plus.

Yet another complication is the rumoured QL Plus. The specification of an enhanced version of the QL has been the subject of speculation for some time now. Such a machine would almost certainly feature 512K of RAM (RAM is cheap nowadays and contributes little to the production cost of a computer). The indications are also that Sinclair may be prepared to abandon its faith in microdrives, opting to build a single disk drive and interface into the new QL. It would obviously make sense to put the four Psion packages into ROM in any upgraded machine but here again the company may have its hands tied – both the ICL OPD and BT's Tonto have the software in ROM and neither would be too pleased to see this as part of the QL's spec.

Sinclair is in a tight corner. The many constraints effectively limit the courses of action left open. Sinclair still holds large unsold stocks of the QL and the Spectrum Plus, yet as speculation concerning the new machines mounts, sales of the existing product range are bound to be depressed, something which will force Sinclair's hand.

Micronet and Computing Age

Log on to Micronet 800 and key *8004444#, and you will be greeted with the title page of a new section of the 'net designed to complement the features within *Computing Age*. The fifty or so frames within this section will be used to give up-to-the-minute news of the magazine and to supplement the information and news we carry. It will also allow Micronet subscribers to have direct access to staff on the magazine via Micronet's mailbox facility.

Note that at present the service is experimental. We are seeking the opinions of readers as to what information we should put up on our frames, and comments on the material we have already entered.

Remember, our area of Micronet begins on frame 8004444.

A slight delay

We apologise to readers who were expecting to see the final part of the series **Qshell** in the first issue of *Computing Age*. The author could not prepare the final installment as he was unable to obtain certain items of hardware that were necessary for him to complete work on the project. At the present time this hardware is still not available – we can however assure readers who were following the series that we shall publish the concluding part as soon as possible.

The article on computer user groups, scheduled to appear in this issue, has been postponed. This decision was taken in order to collate and research feedback from readers concerning their experiences with user groups. If you have a story to tell, be it good or bad, please send it to us.

INDUSTRIAL ACTION

Due to industrial action involving Post Office staff in the Northampton Area, presentation of some sections of this issue of *Computing Age*, including these news pages and the New Products section, are not up to our usual standard.

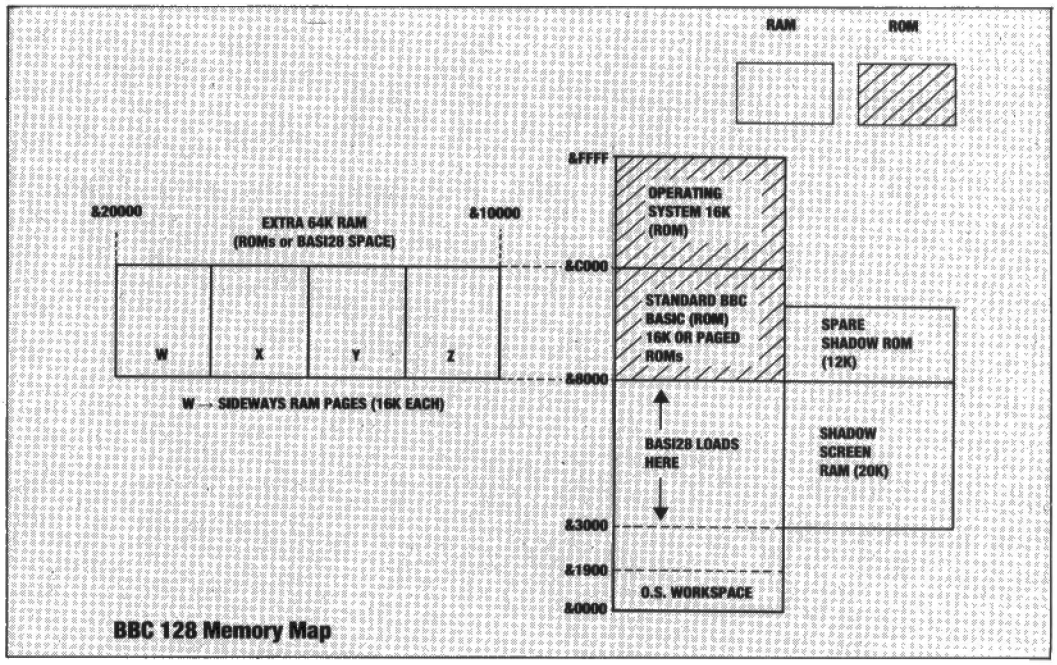
We apologise to readers and advertisers for any inconvenience this may cause.

128K beeb – in perspective

Without warning Acorn unveiled yet another variant of the BBC micro at the PCW Show.

The new machine is a revised and expanded BBC Plus, with an extra 64K RAM, making a total of 128K. This gives the BBC micro "128K" respectability to match rivals like the Commodore, Sinclair QL, Amstrad and Enterprise 128K machines.

A 64K daughterboard has been attached to the right hand edge of the BBC Plus printed circuit board (PCB). It connects via a line of small round contact points running along the edge of the board. It had originally been thought that these mysterious points were only going to be featured in early versions of the BBC+ PCB. Clearly they have been put to a useful purpose!



BBC 128 Memory Map

The 64K card, comprising mainly of just two 32K DRAMs, is utilised in a variety of ways and there are extra OSBYTE and OSWORD commands supplied in a new (Version 2.20) DFS ROM to provide the necessary control. The 64K can be divided into four "soft" ROM slots of 16K each allowing sideways ROM images to be loaded in from disk, or a special version of BBC Basic, BAS128, can be run (also from disk). This makes exclusive use of every byte of the 64K card for Basic programs and variables – Acorn even claims that this is a unique feature for an 8-bit micro.

Originally designed with a purpose-built and efficient operating system architecture, the BBC micro was never intended to operate "paged" add-on memory (like, for example the Apple IIe) beside "sideways" ROMs. Acorn's philosophy was based around "if you want more memory, use a second processor". However the realities of the market has forced Acorn to add a rather inelegant lump of memory on to the architecture they were once so proud of. As can be seen in the accompanying diagram, the Beeb's memory map is getting rather complicated!

Basic 128 is supplied on disk. It is a rewritten version of standard BBC Basic and has now increased to around 20K in size, making it one of the largest Basics in use. The language loads in from &3000 upwards to &8000 and shadow screen RAM (not normally the power-up default) is automatically invoked. Basic PAGE (the start address of Basic programs) magically becomes &10000 as opposed to &1900 as is normal on a BBC with DFS fitted. HIMEN (top of Basic program and variables space) is set to &20000.

Every single one of the 64K (65536 bytes) is set aside for Basic. I don't know of any other 8-bit machine which features this as standard. A Commodore 64, for example, despite featuring 64K RAM only lets the Basic user play with 35K of it, the rest is taken up by the screen and operating system workspace. Incidentally, even many 16-bit machines can't match 64K for Basic programs (a 256K Apricot only allowing a measly 52K for example). On the BBC 128, the shadow area provides bit mapped screen memory and OS workspace remains at &0000 upwards on the main, directly addressable memory map.

The price to pay for this generous version of BBC Basic is a reduction in pace by around 50% on average. This is because the BBC 128 can't directly access the extra 64K – only via speed sapping paging routines. But the speed loss isn't too serious for many applications, as BBC Basic is still one of the fastest around. If it's speed *and* extra memory you need, a 6502 second processor has to be the answer.

In a similar fashion to the Solidisk Technology sideways RAM system, the new 64K can be used to provide four ROM in RAM slots which are subsequently treated by the Beeb's OS as normally fitted sideways ROMs. This is useful because many Beeb owners have more ROMs than their Beebs can hold at one time. A *SRSAVE command is provided to take "images" of ROMs which are saved to disk and then reloadable into sideways RAM by a *SRLOAD command. each of the four 16K slots can be used either for data storage (eg a printer buffer) or as a bona fide ROM. Not all ROMs will run in sideways RAM due to protection systems employed to dissuade illegal copying. Even the latest versions of Acornsoft's own VIEW range of ROMs won't work in BBC 128 sideways RAM. In our own tests, many useful ROMs did operate successfully from BBC 128 SWR, which was at least reassuring.

Slowly, but surely, with the advent of the BBC Plus earlier this year and now the 128, Acorn has chipped away at most of the failings of its outdated BBC Model B. I certainly liked using the 128 very much and it opens up the horizons of BBC micro possibilities. But now the average punter wants at least 255 colours with even higher resolution, even more memory, multitasking etc, etc. Sources are indicating that Acorn is working very hard on those very points, but that means a completely new machine.

Finally, even though the 128 is just £30 dearer than a BBC Plus, at £499 it's still ridiculously over priced.

Don't cry for 'Al at Amstrad

Alan Sugar is said to be 'very upset' with some sections of the computer press – the reason? Suggestions that those people who bought the CPC664 – remember, the ill thought out 64K computer – had been sold down the river.

Amstrad is a company with experience of the consumer electronics industry; until last year that experience was limited to selling TVs and hi-fi systems. Consumers accept the fact that if they were to buy, say, a particular model of video recorder one day only to find that it has been replaced with a superior model at the same price the next, that they would have no automatic right to have their machine upgraded or exchanged for the new model. But, purchasers of computers expect just this degree of support.

Amstrad is by no means the worst offender in terms of selling the public down the river. Sinclair, amongst others, has often given purchasers of the Spectrum cause to complain – usually in reaction to Quantum Drops in price. How do you think someone who bought a £400 QL feels now? In this respect Amstrad has a fairly good track record.

Having defended Amstrad thus far, someone made a howler by marketing the 664. The CPC6128 is the machine that Amstrad should have launched to build on the success of the CPC464. The 6128 was launched in the 'states in the first half of this year, the 664 was launched in this country in April of this year; in other words at the time when the UK was being offered the 64K machine, much of the design of the 128K computer was finalised. Amstrad spent the months following the launch of the 664 denying the fact that the 6128 was due for launch in the UK before the end of this year. It surprised few industry observers when the computer was in fact launched six months before the story according to Amstrad.

Whoever took the decision to go ahead with the 664, which never sold in any significant quantity, and the passing of which has done some damage to Amstrad's reputation should be well and truly carpeted by Alan Sugar, unless of course it was Al himself.

CPC664 users who feel they have been left in the lurch will be able to draw some comfort from the article CP/M anmd Amstrad starting on Page 53.

INTERACTIVE VIDEO – A LOST OPPORTUNITY

Interactive video has great potential in education, destined to be realised by the BBC in a massive historical project. But, argues Edward Warr, the opportunity was wasted

IV technology

Interactive video in its purest form is the control by computer of large amounts of data, both textual and visual. It allows random and specific access, fast forward and reqind facilities as well as freeze-frame, close up and slow motion viewing. Coupled with an authoring system, it allows the user to label or highlight specific portions of film, which in turn makes it the most versatile and dramatic visual aid to learning yet devised.

Although the principles can be applied using tape, it is video-disks which give the best image, the fastest and most accurate accessing and the most durable storage medium. There are two types of disk technology in use, the Capacitance Electrical Disk, now known as Very High Density (VHD) and used by Thorn EMI and JVC, and the Laser or Optical disk, used by Pioneer and Philips.

Of the two, the Laser Disk is the more expensive to produce and the more durable. It is claimed to be virtually indestructible, and is read by a laser beam emitted by a special player. There is no physical contact between the disk and the player, and it is the system used by the Domesday Project, and favoured by all those dealing with archival material.

The VHD disk is made essentially of plastic and is read by a stylus which touches the surface of the disk as it revolves. It is therefore susceptible to wear, although its makers claim that degradation would be over such a long period as to be of minimal concern. There is also a suspicion that the image produced by a VHD disk is liable to picture wobble, whereas the Optical disk gives rock-steady reproduction.

Both disks store immense quantities of data, although moving pictures use more than still photographs or text, of which up to 54,000 frames can be stored.

The technologies are not compatible, in that an Optical Disk cannot be played on a VHD machine, or vice-versa.

Interactive video (IV) marries test data and moving visual images in a single medium: the laser, or optical disk player. The disk is controlled by computer, giving random access to large amounts of data, manipulation of video film, and extensive indexing. IV therefore combines the best of film, books, and computerised data storage: an ideal learning tool.

The year 1984 saw a lot of research into IV by a number of British companies, and the best publicised result was the BBC's Domesday Project, due to be completed in Autumn 1986, to commemorate the 900th anniversary of the Domesday book.

Domesday was heralded as the most exciting educational opportunity of the decade. The concept of putting moving pictures under computer control, storing large quantities of data on an optical disk and having a dedicated player together with a large library of information available in schools and homes all over the country needs only a little thought before the implications strike home.

But 1984 was a year of lost opportunities. Domesday was beset by technical problems and an unenthusiastic industry, whilst the drive and understanding of Domesday's initiators was quickly diluted by financial and bureaucratic considerations which exercised massive constraints, and somewhere in the numerous committee stages the aims and innovative approach of the project were dissipated. The result will be a colour supplement exercise which will do nothing for the interactive video technology on which it is based.

Acorn's involvement in Domesday was almost involuntary, in that the BBC intended to use the BBC micros as the data collection medium, and the makers were required to co-operate. The official Acorn line is still of commitment to interactive video as a principle, particularly in educational contexts. However, the company's financial situation now precludes practical contribution although Acorn will continue to advise and push other, richer institutions to develop IV in a responsible way.

NO SUPPORT

Unfortunately for such highmindedness, indications are that the company most closely associated with computer aided learning has never been wholeheartedly in favour of interactive video. Acorn's directors took two years to launch Acorn Video, and then it was with a system already superceded by companies coming later to the technology. Further, it was a system not affordable by schools or individuals, but designed for the more lucrative, established industrial training market.

The chairmanship of Acorn Video was a part-time post, and the gentleman who held it was thought to regard Domesday as a philanthropic exercise rather than a pioneering venture to establish Britain in the forefront of a revolutionary communications technology. From the beginning, innovation and commitment were lacking, and Acorn Video quickly became an embarrassment to all concerned. As a separate entity, the subsidiary was an early casualty of Olivetti's first rescue package.

Acorn claims that advice is still available to interested parties, but it is difficult to determine from whence it flows. The Technical Director of Acorn Video, who of the three management appointments made was the only man who has firsthand experience of IV technology, left shortly after the announcement of Acorn's difficulties, as did most of those who did the practical work. Acorn Video was not represented at Acorn's summer show, and no-one on the main stand could identify the personalities currently involved in interactive video at Acorn. The only hard fact to emerge was that research and development on IV has stopped. The much-publicised Domesday Project demonstration was a video-taped advertisement which explained in uninspiring terms what Domesday was and how it would work.

The Project cannot achieve what its originators intended. Dogged by political problems and in-fighting between three arrogant companies, it has gone through several metamorphoses, and may experience several more before it is finally served to an indifferent public in 1986, as a one-off BBC2 enterprise which should satisfy Auntie's hierarchy that she is preserving her image as purveyor of learning to the masses.

POWER OF THE IMAGE

Peter Armstrong is overall editor of the Domesday Project, and as a television producer, is naturally aware of the power of visual images. He is fascinated by computer technology and the potential of video disks. Although he recognised that the sheer size of the database needed for

Domesday would preclude moving pictures on the archive disks, he nevertheless believed the project might lead to the opening up of the BBC film libraries. He felt that, "The BBC is uniquely in a position to do this kind of new technology operation, because we have the sources of visual material, the expertise in presenting these in a lively way . . . the editorial, software and engineering experience . . ."

Imagine what one installment of Attenborough's *Life on Earth*, or *Living Planet* could achieve as an interactive video in the classroom, or in the home. In the archives of Broadcasting House are resources which could be used to enhance every type of learning and entertainment facility our society employs. And Domesday as it was conceived might have stimulated the necessary demand for interactive disks; something which is now unlikely.

'As far as the British are concerned, it appears that IV is merely an expensive hobby'

There have been other British casualties in interactive video. Felix Learning Systems, a small company which specialised in systems for firms wishing to incorporate IV methods into staff training programmes, encompassed both hard and software development, tape or disk technology and customised programs. When the parent company was taken over, there was no place for interactive pursuits within the new organisation. Felix was closed down.

So far as the British are concerned, it appears that IV is merely an expensive hobby, and information technology may suffer badly for the lack of financial commitment. Oxford University Press is looking at the possibility of IV for certain academic works. British personnel are involved, but the director of the project is looking to America for his visual resources. It is an indication that the British industry is losing ground.

IV AND MSX

The Japanese last year announced IV interfaces on MSX computers, and were producing interactive disks for home consumption. The failure of the MSX invasion has upset the strategy but Pioneer is now advertising an MSX controllable laser-disk player, although there are as yet no details on software.

Visual Data Systems is a UK owned company whose Managing Director and hardware designer are British, with an American software consultant and Technical Director, William Donaldson. Donaldson sees the UK market as ripe for development and is enthusiastic about the challenge of building a corporation around an emerging awareness of the power of pictures. He bleieves IV in Britain has been hampered by a lack of understanding about its potential, due perhaps to television having less influence here than in America. He expects great things for Visual Data Systems, which is currently involved in interactive video designed to instruct rescue personnel in the layout, construction and possible disasters of oil-rigs. The potential customers are British and European, but it is essentially American technology they will buy.

It is entirely possible that Visual Data Systems represents the future for interactive video here, with more William Donaldsons bringing their training, expertise and enthusiasm to revitalise the jaded industries of the UK. It's a familiar pattern, but it need not have happened in one of the potentially most rewarding developments of micro-technology.

The Domesday Project

The BBC's Domesday Project, due to be completed in Autumn 1986, was announced as part of an initiative to commemorate the 900th anniversary of the Domesday Book. Peter Armstrong, BBC television producer and editor of the Project, wanted to supplement a proposed documentary series on William the Conqueror and his tax-assessment tome, to create "a benchmark in the present, to go from the Domesday Book to the Domesday Disk."

It is the largest survey of a country ever undertaken and the idea is to store the results as text and still pictures on two optical video disks. These will be available to the public together with a dedicated player, incorporating a laser-disk player and a micro computer system. It uses a low-level of interactive video, allowing an area to be studied through maps, statistics and pictures at the discretion of the user. The data has been collected by schoolchildren, and will be edited by a board of academics. Pictures will be supplied by schools and the public.

Despite the massive storage capacity of the disks, Domesday has already had to compromise on the type and format of the data, so that doubts about the accuracy, interest and value of the undertaking already exist. Some IV experts have termed it a disaster because too little thought was given to the matter of cross-referencing and indexing. It seems unlikely that the end result will reflect the pre-occupations of the community, as was intended, because of the need for stringent editing: or that many people will ever use the disks. At an estimated cost of approximately £1500, the Domesday Player will be too expensive for most schools, libraries or civic centres, let alone for individuals. And unless more interactive material becomes quickly available on disk – and there is little indication that the BBC is planning anything – there would seem to be little point in investing in the system.

News continued

The word according to Atari

Talking to **Max Bembridge,** Atari's UK Managing Director, one gets the strong impression that Jack Tramiel's abrasive, high profile, but paradoxical style has a contagious quality.

Max had plenty to say about Atari's market strategy for the 520ST, fired a liberal quantity of poisoned darts at his rivals, **Sinclair** and **Commodore,** and shut up like a clam when questioned about Atari's new Winchester disk system.

Surrounded by pressed and sweaty hoards in the din of the **Personal Computer World Show** I enquired of Max, what could that device, in an old style XL case but attached to a 520ST, possibly be? A hard disk unit perhaps? 'We're not saying anything about that'. 'We're testing market reaction and looking for feedback, but saying nothing about that'. (The animatic approach is calculated to create interest).

As for ST progress: the machines with faulty screening (see last month's issue) were, says Max, 100 of a bad batch of 1000 which 'got by', the trouble now resolved. TOS and GEM will be in **ROM** 'late September early October, and **upgrades** will be available to buyers of the early machines at 'minimal cost'. You mean the cost of the memory? 'That's right'.

We have information that Gem Write and DR Basic won't be ready on the ST until early October. Max looks **innocent.** 'that's probably accurate – it's Digital Research's problem. We'll be supplying free upgrades'.

Thanks Max. It's a very impressive stand you have here, but isn't there rather a lot of software of the **games** variety? 'Not at all'. '60-70% is serious applications software, maybe 15% games, and the rest fits into neither category'. 'We're working with **over 100** software houses and they must be producing in the region of 200 different packages'.

Now, as we all know, Commodore tried to market the 64 as a home and office machine but gave up when the users decided it was best used for games. And Sir Clive's 'new market' for the hermaphrodite QL has failed to materialise, and, just to add fuel to the fire, what about that Amiga. 'The **Amiga?'** (brusque style comes to the fore) 'Our engineers have evaluated it – they say it's just an expensive games machine.' 'The ST is to be used by the individual where they work and live. Commodore failed but computer literacy is much higher now and justifies a home/business machine' But isn't that the same philosophy as **Sinclair?** 'No, we are much more serious in regard to our customers'. 'We're not really interested in dumping plastic boxes on the public . . .' **Nuff said.**

LETTERS

Send your letters to The Editor, Computing Age, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

ICL is British, and booming

Sir,
The article headed 'Acorn takes on IBM with one-per-bench' in the October issue of *Computing Age* contains two major errors relating to ICL.

- It is untrue that ICL has 'passed into the hands of a foreign multinational'. STC, which merged with ICL in 1984, is British-owned. ITT's shareholding in the company is just 24%.
- It is untrue that ICL has required 'massive injections of cash to keep it from complete collapse'. Since the recovery programme initiated in 1981 the company has achieved consistent profitable growth. The figures for the 15-month period September 1984 – December 1985 speak for themselves: Turnover £1,124m; Operating Profits £45.9m – achieved without 'massive injections of cash'.

I should be grateful if you would publish this letter so that readers both new and old will not be misled.

A. R. Rousell
Managing Director, ICL (UK) Limited

On the first point, we have to admit to being unfair, if not incorrect. The author was unfortunately unaware of IT+T's recent sale of it's STC holdings, which took it from a dominant position to that of a major shareholder.

However the 'massive injections of cash' referred to Government grants totalling £55 million given during the 'seventies for research and development (repayable only if ICL made over 7.5% profit on turnover, which it did not). Again, in 1981, ICL borrowed £200 million in Government-secured loans from its four major bankers. We believe the matter of securing these loans was resolved when STC took over ICL in August 1984. But if our comments gave the impression that ICL is not now a successful company, then we thank you for putting the record straight.

$e + mc^2 = 3''$

I have been a frequent is somewhat irregular reader of *Electronics and Computing Monthly* and recently I purchased a copy of your new magazine *Computing Age*. I will more than likely continue to read forthcoming issues with interest. However, I was dismayed with the repeated references to how non-standard the 3" drive is, and yet almost within the same breath the Amstrad's popularity and value for money were preached.

Apart from the Amstrad, the Einstein uses 3" disks. The Einstein, however, goes without mention. Incidentally the Einstein also provides disk swap prompts for those not fortunate enough to own a twin disk system.

It may be obvious from the tone of my letter but I am (you guessed it) an Einstein owner. My package of twin disk machine, monochrome monitor, printer, 80 column card, printer cable, Crystal Basic, BBC B, DR LOGO and several games represents pretty good value for money at £800. Since then I've added two comms packages, a word processor (80 column), Pascal and a database.

Machine specific software is by no means as visible as that for the Amstrad but there is more than I can afford with more on the way. CP/M software can also be run and the video processor's own 16K RAM means that the 64K CPU RAM is unencumbered.

If there is a fault with my machine it is that TATUNG should be writing this, but then if TATUNG's promotion was more aggressive they wouldn't need to write.

One might construe their silence as the forerunner to a new machine, which I'm told is under development. However, their user magazine denies its imminent release as this will 'only confuse the market'.

I thank you for your indulgence and hope you will find room to print this monologue/advert. Having burnt my fingers once with the MEMOTECH I could be described as a neurotic about the possibility, however remote, of a repeat performance.

D. J. West
Aylesbury, Bucks.

A singular standard

I would just like to point out a few inaccuracies in the News page of your October issue regarding Amstrad Computers.

The video chip on the CPC6128 is in fact the same as on our earlier machines, the trusty 6845. Your confusion seems to arise from the fact that the machine is supplied with Digital Research GSX, the Graphics System extensions for CP/M. As far as I know DR do not manufacture chips!

As for the non-standard 3" disks, was it really so long ago that 8" was the recognised standard and that 5¼" disks were regarded with suspicion? The 3" disk is certainly *our* standard and a great number of *standard* CP/M packages are available now in this format.

Regarding communications, the terminal emulator software is supplied with the PCW8256 and the CPS8256 Centronics/RS232 interface is available as an optional extra. To add the cost of a modem to the PCW8256 and then compare the price with an Atari 520ST, which also would require the purchase of a modem if communications facilities were required, is a little unfair.

Ken Clark
Amsoft Technical

*Whoops! How did that 'Digital Research supplied' video chip sneak in?!! But as for 3" disk drives, if this becomes a 'de facto industry standard' (and yes we know it's **Amstrad's** standard) before the 3.5" used by Apricot, portable PC manufacturers too numerous to mention, as well as Big Blue too in the near future, or so it is rumoured, then we'll eat our hats. PS. What's a Tantungeinstein?*

An even simpler EPROM blower

Your reprinting and updating of the previously published design for a BBC micro EPROM programmer prompts me to write.

First let me say that what I write is not intended in any way as a criticism of the design. That is concise and complete, and with the inclusion of a 6v supply for Vcc, likely to do its job as well as any device costing many times more. It is simply that a do-it-yourselfer, attracted by the simplicity of the design, may be interested to know that it is capable of being simplified to an even greater extent.

First IC1. This is included to clean the NPGFC signal. In this application, glitches caused by the 2MHz to 1MHz clock transition have no effect on the 6821s. Although it is nice to clean this line, it is not necessary.

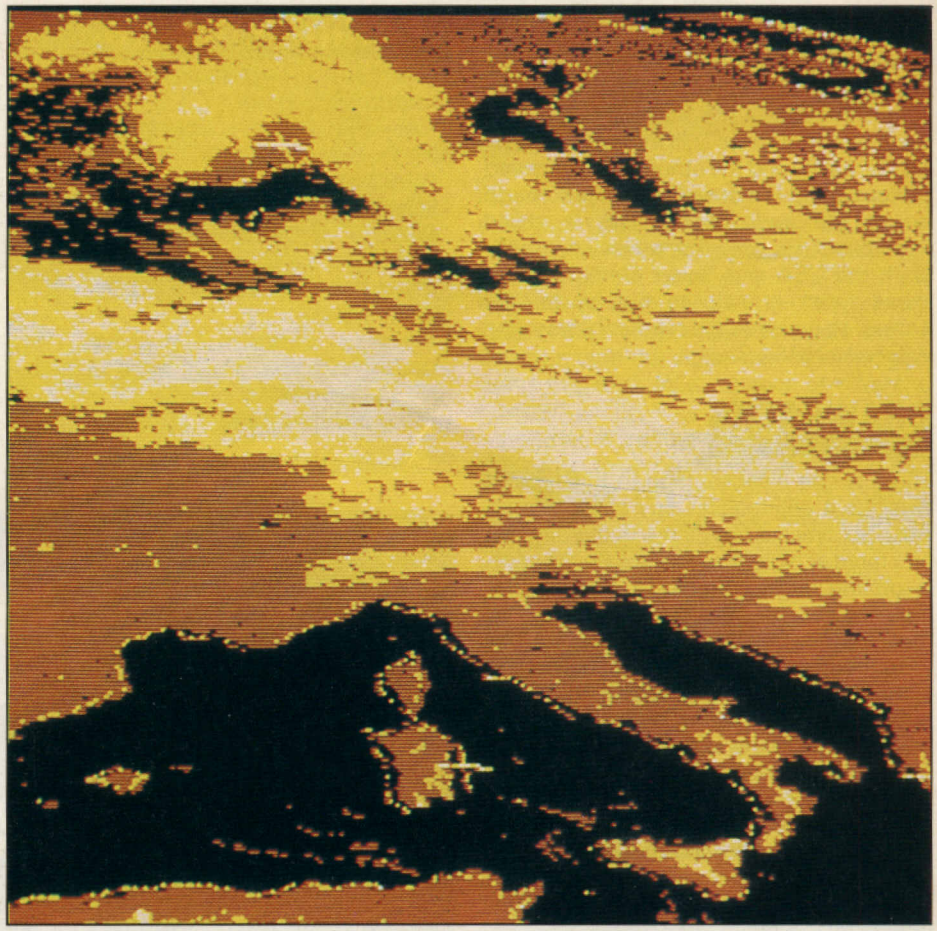
ICs 2 & 3 may also be removed from the design as long as line 10 of the bus (NPGFC), is connected directly to pin 23 of IC4, and line 12 of the bus (NPGFD), is connected directly to pin 23 of IC5. The software addresses would have to be altered as already stated.

The authors pointed out in their original article that the transistor switching of Vpp provided by Q1 & Q2, is not strictly necessary.

I'll not pursue these arguments further for fear that the circuit will disappear altogether. Just let me say that I have been using a programmer of this modified form for some time and am completely happy with it.

A. J. Donald
Ilford, Essex.

Below The equipment: BBC micro Timestep Receiver, Timestep Interface Mk2, stereo cassette recorder, Microvitec monitor, Icom shortwave receiver ICR70 (for wefax pictures and charts) and AOR2001 scanning VHF receiver. **Right** Cloud movements in Southern Europe: the view from METEOSTAT, downloaded to a BBC micro via Timestep.



Capturing satellite information and processing it on a micro isn't as difficult as it sounds – in the US they're all at it. So Robin Mudge, who built his first satellite receiver 12 years ago, took the Timestep receiver for a trial orbit.

HOOK UP TO SPACE

Twenty five years ago the first pictures were transmitted back to earth from space. They came from the TIROS satellite (Television and Infra-Red Observational Satellite) built by the US. Since that moment the work of the meteorologist has been transformed.

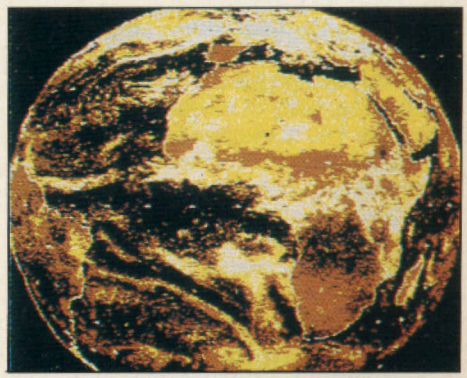
Before, information was strictly second hand, being sent in from weather stations located all over the earth's surface, which took time and always came after the weather had happened. Today modern satellites give the meteorologist an almost instantaneous view of the weather on a global scale, as it happens. Tune in to the weather forecast on tv and you're bound to see one of the hundreds of pictures sent back to earth every day.

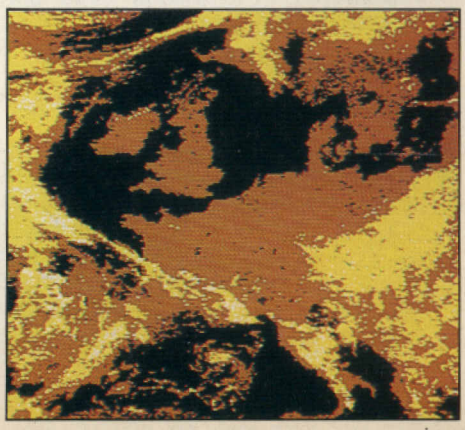
The professionals use very expensive equipment costing thousands of pounds get the best pictures but the equipment onboard the satellite was designed with cheap receiving systems in mind.

For years amateurs have been building receiving stations for weather satellites, but you did have to be an enthusiast! Twelve years ago I made one out of a bag of bits and an old oscilloscope dumped on my college desk by my tutor, but today if you have a BBC micro and about £300, Timestep Electronics will supply equipment to enable you to receive and display weather pictures in your own home with little difficulty.

Some background on the satellites would be useful. There are quite a few of them looking back at earth but they all fall into two broad groups. The first group are polar orbiting. They pass more or less over the north and south poles, taking about 102 minutes for each revolution. As they go round, the earth slowly turns underneath, by about 25.5 degrees for each satellite revolution, so each time the satellite goes round, it looks at a different part of the globe. In this way a complete picture of the earth is built up in strips, each one slightly overlapping the last. The satellite takes two pictures side by side, one by visible light, the other by infra-red.

As the satellite moves forward a device called a Scanning Radiometer (basically a rotating mirror and photo sensitive tube).





Upper right The world at your fingertips: Satellite pictures can be further processed with the BBC. **Right** A cloud-free UK from METEOSTAT: the BBC can be used to correct distortion and adjust the picture parameters.

scans the earth underneath, building up a TV picture at 120 lines a minute as a continuous strip. This is a slow scan TV picture, your domestic TV producing a picture with 625 lines in 1/25th of a second. Each scanned line is split into two, one half for the visible and the other for the infra-red pictures, and is transmitted back to earth as an FM radio signal. This is called Automatic Picture Transmission (APT). Both the USA and Soviet Union operate these types of satellite but by far the easiest to receive on a regular basis is the American NOAA 9.

DRAWBACKS

There is one disadvantage to this type of satellite: it only passes any one place on earth six times a day, three in the daylight and three at night (this is because the earth is rotating below it). Because of the way the aerial works usually only one or two of these passes can be received.

To overcome this problem there is a second type of weather satellite, the Geostationary type. They are placed above the equator and rotate at the same speed as the earth and in the same direction. This means that they are always facing the same point on the earth. There are four of these satellites covering the whole globe. The one facing us and which we can receive is called METEOSAT 2, which transmits all of the time but instead of producing a continuous 'strip' picture it sends a discrete one made up of 800 lines, at four lines a second. This satellite uses very similar APT equipment. But while there are pictures all the time, there is a snag, for it is much more difficult to receive and the aerial costs a lot more.

The Timestep equipment works with both of these satellites but the NOAAs are the easiest and on the BBC micro produce the best results. The TimeStep outfit comes as four parts, each one available separately. The first is an aerial and a preamp, which looks like an old fashioned 'turnstyle', there being two sets of four elements mounted one set above the other. The top set is the actual receiving bit, the

'The interface clock synchronises itself to the signal and acts as a "flywheel" if the picture fades'

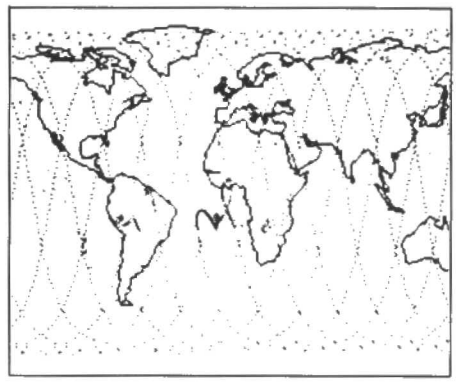
driven elements, and the lower ones reflectors. The aerial has to be mounted looking up at the sky and above any others like a radio or TV aerial. To all intents and purposes it is omnidirectional and should receive a signal from horizon to horizon (buildings and other obstacles will limit this in practice). You can also buy an aerial preamp that plugs into the down lead, dramatically improving the signal. The second and third bits, the receiver and interface, are contained in matching cream, black and anodised aluminium cases and are supplied with all interconnecting leads.

The receiver in its basic form comes with a crystal to enable it to receive NOAA 9 on 137.62MHz. There are a number of labelled holes in the front panel including a large rectangular one on the left hand side. These are to accept a scanning module which will allow the automatic scanning and recording of the entire 137MHz satellite band, giving access to all sorts of satellites.

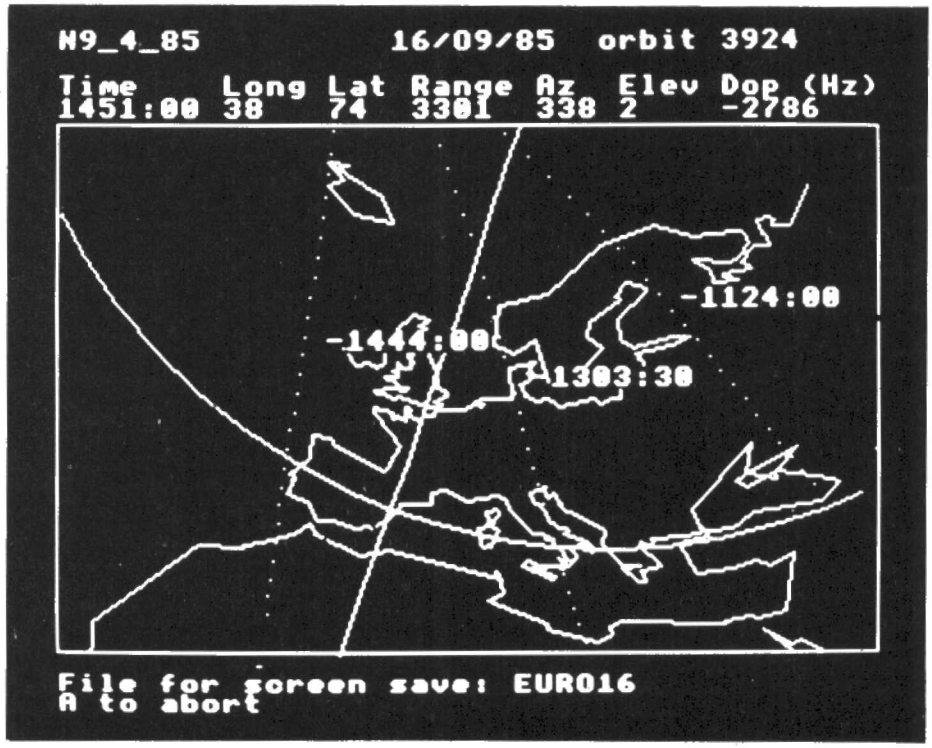
The interface turns the received APT signals into a form acceptable to the computer. The APT signal arrives as an amplitude modulated 2.4KHz audio tone which changes with the brightness of the picture. This is subjected to comprehensive interference filtering and then turned into digital values representing brightness by an analogue to digital converter, the 2Hz line frequency being too fast for the BBC's internal A/D converter to cope with.

Equipment info

Aerial £34 or £64 with the preamp built in and ready to bolt to a mast.
Receiver £79.95, with scanner £198.
Interface unit £94.00.
Power lead £8.50.
Software £37.50.
METEOSAT dish and convertor £355.00.
Frame store, produces very high quality pictures without a computer, £369.50.
Further info from:
Timestep Electronics Ltd, Wichambrook, Newmarket, Suffolk CB8 8QA, tel 0440 820040.
AR2001 Receiver from Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 6LE.



Above and below: Tracking and positioning information for the NOAA9 satellite.



'The software turns the BBC micro into a slow scan television set with individually adjustable picture parameters'

ANTI-FADE

An accurate crystal controlled clock is also included, supplying either 2Hz or 4Hz pulses to the computer for the software to use in the display of the picture. Looking at the diagram of the received waveform you can see two large synchronising pulses, one marking the beginning of a line, the other splitting the visible and infra-red pictures. Each of these pulses has to be accurately lined up one under the other to produce a linear picture. It would be possible to do this from the signal itself but if it faded badly the software would be in trouble. The

interface clock synchronises itself to the signal and acts as a 'flywheel' if the signal fades. This also comes into action if the signal is recorded and played back through the interface.

The back of the interface contains sockets for connection to the receiver and tape recorder. Two ribbon cables take signals to the user and printer ports of the BBC. Both the receiver and interface are powered from the BBC micro's disk power socket (a lead is included). This has the small disadvantage that when recording signals the micro has to be turned on.

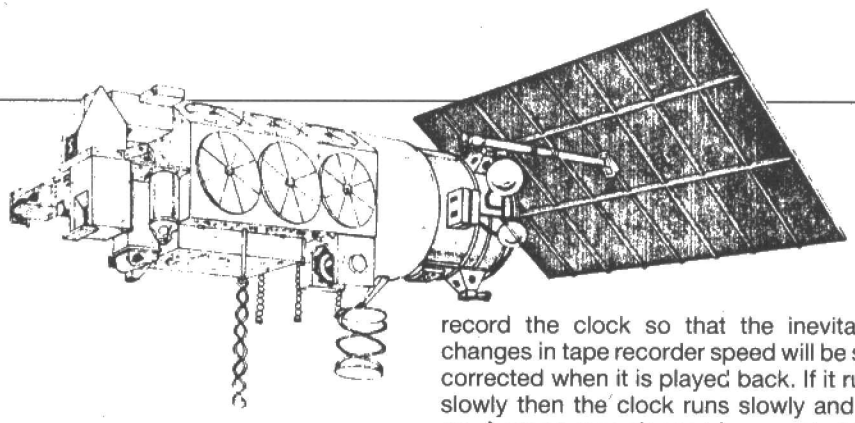
The Mark 2 interface had control switches for the filtering and black levels, which supported one stereo tape recorder and was a little tricky to connect up. This has changed in the new Mark 3. The filtering is still present, but since experience proved there was no reason to adjust it (indeed it could complicate matters), the filter switch bank has been replaced by a much more useful one. It selects the source of signals from one of two tape recorders or the receiver itself, which dramatically simplifies the connection of the system. There is also a rotary control on the left hand side to adjust the input level, compensating for different receivers, tape recorders and variations in the signals themselves.

Finally the software. This is simplicity itself to use. Satpic comes as a ROM and is installed in one of the BBC's sideways ROM sockets, and a function key guide is included. Typing *S calls the software into action. It defaults to receive pictures from METEOSAT 2 but by pressing the escape key a menu is presented.

The software displays pictures in Mode 1 and in four colours, each one representing a different brightness level. Any one of 10 combinations can be selected from the menu. Of course four colours and a resolution of 320 by 256 pixels doesn't really show what these satellites really do but it is still sufficient to produce some good results.

The software turns the BBC computer into a slow scan television set controlling the starting position of the line scan, it's time base, its pixel rate and the picture aspect ratio. Parameters for all of these can be individually adjusted from the keyboard or selected from a preset range on the function keys. These include two options for the NOAA images, the display of METEOSAT images, and a few other interesting ones which enable you to receive weather charts and news pictures. These are fun but because of the limitations of the BBC micro it is very difficult to see fine detail on the charts, particularly some of the text. (You need an extra shortwave radio for these.)

Because NOAA produces two pictures side by side one option produces both of them, the other allows just the visible or the infra-red to be displayed. That option also corrects some of the geometric distortion in the pictures. There is also a zoom facility for use on METEOSAT pictures, and a facility that stores the image to disk, automatically creating file names.



'As soon as I heard the PING PING PING of the satellite signal I turned the system on and watched the picture build up'

PROCESSING

Documentation takes the form of a series of printed sheets, instructions and predictions of when the satellite is due over Europe. One is particularly useful; called 'Now I've got it all what do I do with it?' it outlines the difference between a live system and a recording one. The recording one is better because you can process images a number of ways at leisure. I couldn't wait though, and as soon as I heard the characteristic PING PING PING sound of the satellite signal I turned the system on and watched the picture build up in front of my eyes. The passes last for about 15 minutes, enough to fill two screens, but apart from storing them on disk no further processing can be done to the pictures.

The disk based images can be printed on a suitable dot matrix printer by using Computer Concepts' Printmaster. I would like to see a printer dump routine written into the Satpic ROM. It shouldn't take much space.

To set up a recording system it is better to use a stereo tape recorder. It can be cassette or reel to reel, but whichever you choose try to find one with a remote start-stop facility. The satellite is recorded on one channel and the clock signal from the interface on the other. It is necessary to record the clock so that the inevitable changes in tape recorder speed will be self corrected when it is played back. If it runs slowly then the clock runs slowly and so on. A mono recorder can be used but the edge of the picture is likely to wiggle about. Once on tape the signal can be displayed using the BBC in a number of different modes.

Another advantage is that the system can be left to record passes automatically. The receiver has a SQUELCH control which activates a tape relay when a strong signal is received, thus turning the recorder on and off as satellites pass overhead.

INTERFERENCE

One problem that can creep in is RF interference from BBC micros and Microvitec monitors, although some precautions can be taken like spraying the inside of the micro's case (remember to take the circuit board out!) with zinc paint. A separate power supply will be available as an option.

Receiving pictures from METEOSAT 2 is more difficult. A special dish aerial is needed to receive the signals it transmits on 1.6Hz. The dish is pointed directly at the satellite which lies due south and about 25 degrees above the horizon. There must be nothing obscuring the path of the signal. Timestep supplies a dish and a converter that changes the 1.6GHz into 137.62 so that the same receiver can be used. The dish, whilst cheaper than any other, is still expensive at £355.

The fact that all the items in this outfit are available separately is very useful. For example you don't have to use the Timestep receiver. If you are really keen, a scanning receiver that covers more frequencies could be for you. One such is the AR2001, but it must be modified for use with weather satellites at the time of purchase. Check other types carefully, for very few will work properly in this application. A good short wave radio is also needed for the other applications; a suitable one should cost between £400 and £800. There are plenty of other computer applications in short wave radio listening to try out with it.

In brief

- There are a number of manufacturers either producing or about to produce outfits for receiving weather satellites and others like Surrey University's UOSTAT 1 and 2, but the Timestep equipment is very good and probably the cheapest.
- It is well made and relatively easy to use, and is certainly a lot of fun.
- A word of warning: buy it ready made. The self assembly kits require a lot of skill and test equipment. Don't even buy the aerial preamp uncased: it's far too easy to make a mistake and connect it up backwards so the signal gets weaker when it is turned on. (Guess how I know that!).
- If you thought computing was addictive you haven't experienced anything yet.

MORE SPEED MORE SPACE

Winchester disks used to be as big as washing machines and cost the earth, but the latest models may herald the death of the floppy, writes Mike James.

It's about 10 years since personal computers first became available and in that time the trend has always been toward more performance for less money. At the start we used audio cassettes (some still do), then 5¼" disks offering 80K of fast reliable storage. Over the years the 5¼" disk has been the storage workhorse of the personal computer world and it has held its place, getting cheaper and better as each year passed. First double sided, then double density, then double tracking have made the current standard something in the region of 800K to 1M per drive. At the moment manufacturers are working on sophisticated improvements to 5¼" drive technology and are promising to break the 2M per drive barrier with 3M (Amlyn Corp) and 3.3M (Drivetec Inc) drives.

While all this has been going on an alternative method of providing high storage capacities has been getting smaller and cheaper. Winchester fixed or rigid disks have been around as long as floppy disks but initially they were large and very, very expensive when compared to the cost of micro hardware. However, even in the early days, fixed disks offered storage capacities of 20M to 50M and sometimes they proved the only way to solve a storage problem irrespective of cost or their suitability for use with a microcomputer. All this is about to change and the current champ-

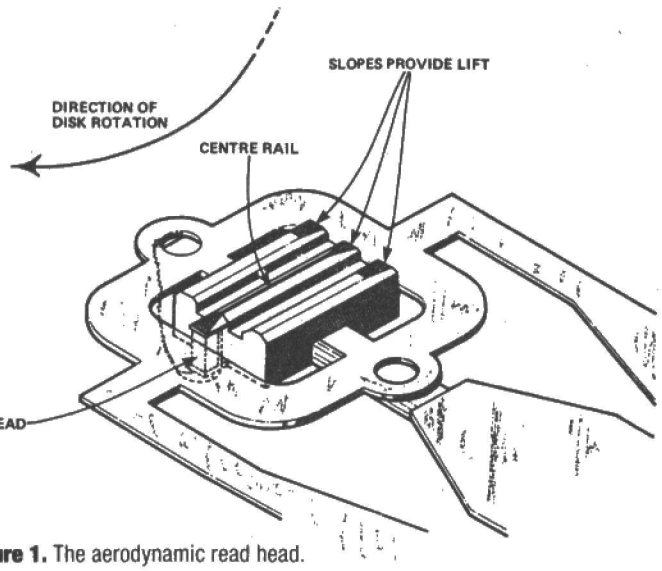


Figure 1. The aerodynamic read head.

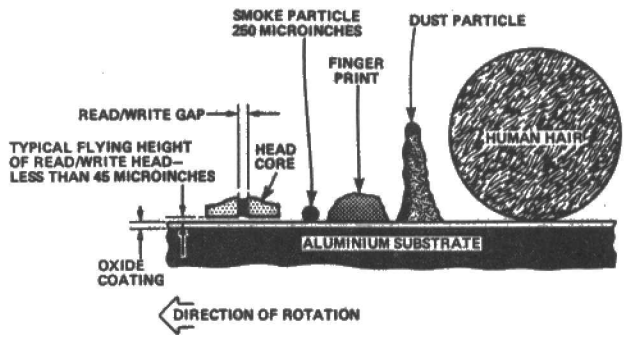
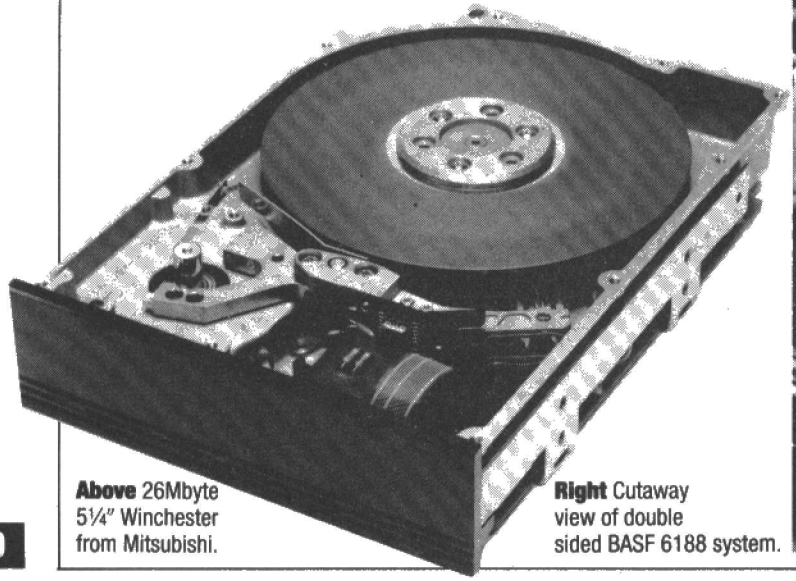
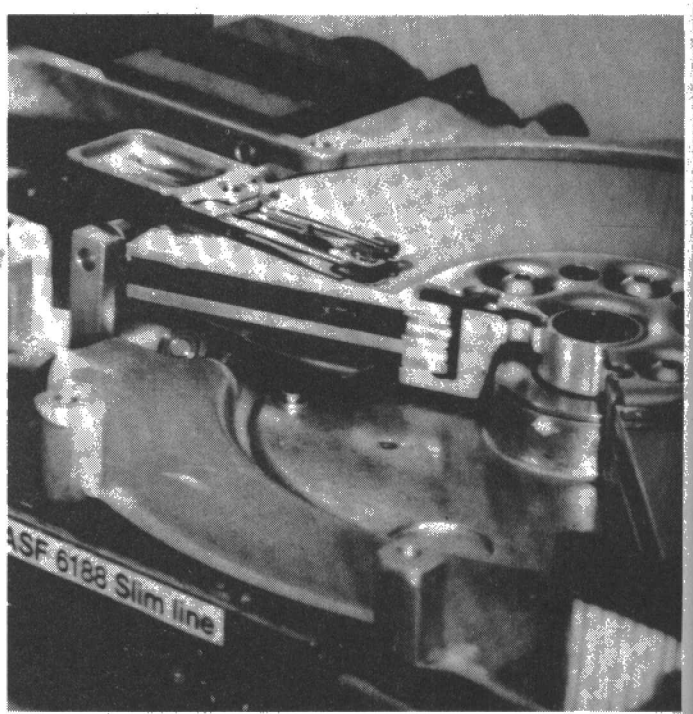


Figure 2. Fly height comparisons.



Above 26Mbyte 5¼" Winchester from Mitsubishi.



Right Cutaway view of double sided BASF 6188 system.

ion disk storage technology stands a good chance of being dead technology in another year or two.

WHAT'S A WINCHESTER?

All disk drives utilise the same basic principles of a spinning disk of magnetic material and a magnetic read/write head that can be positioned over any of a number of concentric tracks. What makes them different is how fast they spin the disk, how close they can pack tracks together and how much data they can cram into a track. Floppy disk drives are limited in how fast they can spin a disk by the construction of the diskette and the amount of wear generated by the read/write head. They are also limited in how closely they can pack tracks by the mechanical inaccuracies inherent in loading floppy diskettes into a drive. That is, to guarantee that the head can be positioned near to the centre of any given track the tracks have to be wide to allow for diskette movement. Finally they are limited in how many bits they can pack into a single track by the size of dust and dirt particles that contaminate a typical diskette surface.

The solution to each of these problems is fairly obvious if you think about altering the nature of the disk and the read/write head. If you replace the flexible plastic disk and its jacket by a rigid disk firmly fixed to a centre spindle within an enclosure that doesn't touch it then you can spin it very fast – as much as 10 times faster then a floppy.

Using a rigid disk also solves the problem of inaccuracies in positioning the read/write head, as long as you add the extra condition that the disk is fixed and not exchangeable. The reason for this is twofold: first, because the disk is rigid there is less chance of mechanical deformation with use, and second, as it is fixed there is no need to worry about the problem of trying to read disks written by other drives with slightly different track positioning.

The problem of dust particles is solved simply by making the enclosure hermetically sealed and filled with clean air. With these innovations we have solved all of the problems but one – disk wear due to the head being in contact with the rapidly rotating and comparatively soft surface.

To solve the disk wear problem requires some inspiration. The most obvious approach is to lift the head away from the disk but this places an air gap between the magnetic material and the head and

'If you design a small, light head with an aerodynamic shape, it will "fly" just above the surface of the spinning disk, eliminating wear'

greatly reduces its effectiveness. In other words, breaking the contact between the head and the disk means that you need a stronger magnetic field to magnetise it and a more sensitive read head and amplifiers to pick up the magnetic variations. Of course if you can reduce the air gap to something very small then you can probably still make a read/write head that works, but how do you suspend a head a few microinches above the surface of a spinning disk and move it from track to track? The answer is surprisingly easy – once you know it!

A disk that is spinning very fast tends to drag a thin layer of air close to its surface around with it at almost the same speed as it is rotating. If you design a small, light read/write head that has an aerodynamic shape it can be made to 'fly' just above the surface of the disk **(Figure 1).** Flying heights vary from 800 microinches all the way down to 12 microinches, which is very close – by comparison a human hair is 3000 microinches in diameter **(Figure 2).**

The combination of a rigid disk, a hermetically sealed enclosure and a flying head are usually referred to as 'Winchester' technology after the IBM lab that invented it, although disk drives using Winchester technology are equally often referred to as rigid disks, hard disks and fixed disks.

SPINNING UP

Although Winchester disks use the same basic magnetic disk technology as floppies they have a distinct behaviour pattern. The most noticeable thing about any Winchester disk, especially the large old fashioned type, is the whining noise from within. This is sometimes masked by the louder noise of a fan but it is always there and it caused by the disk spinning at such high speeds.

There is no question of running a Winchester in start-up mode, like some floppies, as it takes some minutes for a disk to reach over 3000 revs per minute and as a consequence all Winchester disks have to be allowed a 'spin up' time before the computer attempts to use them. In the same way Winchesters often need a 'spin down'

Why use hard disks?

The most obvious reason for wanting to use a Winchester disk is the sheer volume of storage capacity. How else could you get 10M of online storage? But there is another reason – Winchesters are fast. Typically a Winchester will retrieve a file 10 times faster than a floppy and this can make a great deal of difference to the overall speed of an application. In particular if you are interested in sharing a disk either by way of a multi-user/multi-tasking operating system or a local area network then a Winchester provides enough storage to make it worth sharing and enough speed to make access times reasonable.

Buyers guide

The following is a list of some of the Winchester disk systems that are available for popular microcomputers. Note that at the current price it doesn't make sense to fit a Winchester to the lower cost 8 bit micros. On the other hand if the price continues to fall then Winchesters become attractive upgrades for machines such as the BBC Micro, the QL and the new Atari ST.

The BBC Micro: Midwich make three Winchester disks for the BBC Micro – a 5M, a 10M and a 20M drive. They attach via the 1MHz bus and the disk controller is contained within the drive case. The system comes complete with the Midwich Winchester Filing System (MWFS) ROM which is operationally compatible with the standard DFS.

Sinclair QL: When you're talking hard disks the QL can only be considered an afterthought – at least in monetary terms. A 10Mb (9.7Mb formatted) Winchester disk available from CST will cost £1200 plus a further £400 for an expansion motherboard and disk drive if you are not prepared to spend hours backing up to 80 or so microdrives.

However, the performance is impressive (1.6uS per byte) and with the possibility of some networking firmware in the near future could make a multiuser QL installation a very attractive proposition.

Medic Datasystems is also believed to be producing a Winchester, however in view of severe production problems it would be advisable to wait for these to appear in retail stores.

Apricot F1/F1e: The standard Winchester disk for the Apricot F1/F1e has to be their own MSD 3½" 10M drive. This is supplied as a pair of units about 6" x 4" x 2½" which clip together. One of the units is a power supply and the other the drive proper. To install the drive you have to plug a disk controller card into the internal expansion slot which means opening the case and fiddling. This is fairly easy but be careful that you have everything connected the right way round before switching on (like all ACT user manuals the installation instructions are far from clear). However the easy part is that the F1/F1e's ROM BIOS includes a driver for the Winchester and so it is automatically incorporated into MS DOS as drive A, while the old floppy is redesignated as drive B.

Atari 520ST: At the PCW show Atari showed a prototype hard disk unit for the 520ST, but refused to give any technical specifications or details of availability and price.

Sanyo 550/555: Logitek are the people to talk to about hard disks for the Sanyo MBC series. The company can supply internal drives with a 10M capacity starting at £1995. External drives with capacities of 10, 20, 30 and 40M are also available. Prices range from £1200 to £2445. The external drives are supported by a range of tape streamers and file server systems.

Suppliers: Midwich 0379 4131. Apricot – any ACT dealer. Microware 01 281 2431. Digitask 0342 24631. Logitek 0257 426644. CST 0223 323302.

Drive	Storage Mbyte	rotation speed	track density	bit density	latency
5¼" high performance floppy	1	300rpm	96tpi	5922pi	100ms
5¼"Winchester	10	3536rpm	690tpi	9201bpi	8ms
3½" Winchester	10		600tpi		

time before the computer is switched off.

Spin up and spin down accounts for most of the complicated instructions that manufacturers sometimes give for switching machines that use Winchesters on and off – eg, switch the Winchester on first, wait until the ready light comes on and then switch the computer on. Some avoid this difficulty by including hardware interlocks in the disk controller. The IBM XT avoids the spin up problem by taking a few hours off to run a diagnostic program each time you switch on!

The fact that a Winchester's head flies above the surface of the disk is the main reason for the increased storage capacity, but it is also a source of problems in its own right. Any large vibration or contamination on the disk surface can cause the head to nose dive or 'crash' onto the disk. (This is probably the origin of the use of the term crash in computer jargon.) When a head crashes in this way the result is usually permanent damage to the disk and very often the head.

Of course when the disk is switched off the head must be in contact with the disk's surface and as the disk starts to spin there is bound to be some rubbing of the head. To avoid this initial contact damaging areas of the disk where data is stored, most Winchesters have a special 'head parking' area where the head can be left just before the disk is spun down. This is fine and all works well when the computer is switched off in an orderly fashion but just consider the effect of a power cut or even a power surge! Winchesters tend to work best if they are installed in one place, never moved and never subjected to power failures.

The first Winchester disks were washing machine sized affairs with only modest storage capacities. The same process of refinement that has been at work on the floppy disk has been working on the Winchester and the current family of Winchesters still includes 27" diameter monsters, but it also includes friendly 5¼", 5¼" half height and amazing 3½" micro drives!

The table (above), will allow you to compare some of the operational characteristics of the basic drive mechanisms (a 5¼" drive is included as a familiar standard). In each category you can find drives with a worse or better performance but the ones quoted are typical. The figures are self explanatory apart from the final column – latency is the average time it takes to find any given piece of data.

Unfortunately Winchester disks are not all good news. Although the cost of a Winchester disk drive is quite reasonable (around £300 to £400 for 10M), it cannot simply be connected to an existing floppy disk controller. You need a special Winchester disk controller and usually extra software to add a Winchester disk to a system.

Winchester disk controllers perform a similar function to floppy disk controllers but with a number of important differences. For one thing Winchester disks read and write data at a much higher rate than floppies – roughly 10 times faster – and some older 8 bit micros cannot handle data that fast. The solution is to use DMA (Direct Memory Access) to bypass the need for the CPU to deal with disk data.

'As well as the 27" monsters, there are now 5¼" Winchesters, 5¼" half-height and amazing 3½" micro drives'

Once you have a drive and a controller for your machine you still have the problem of integrating it into your operating system. Older operating systems such as CP/M V1 couldn't handle anything like 10M in a single drive. Newer operating systems such as MS DOS were designed with Winchester disks in mind and adding a high capacity disk is just a matter of writing a device driver.

Handling such high capacities is one thing but making such a disk easy to use is quite another. Easy use of 10M and more of storage involves the provision of multiple directories. The number of files that you are likely to maintain on a 10M disk might run into hundreds and a single directory listing would soon become unwieldy. The standard answer is to allow the user to create any number of directories, each of which might be used to store a small number of files concerning a particular application – a spread sheet directory, a Basic directory, a text processing directory, etc. Not all disk operating systems have the ability to handle multiple directories – MS DOS V1 and BBC DOS do not to name just two – and integrating a Winchester disk with these operating systems is a little more difficult.

BACKUP

Suppose you have a 10M Winchester disk correctly hooked up to a controller that works well with your machine and an operating system that supports it – surely everything is problem free? The answer is, as nearly every Winchester user quickly discovers, no! The reason is that Winchesters are *fixed* disks – you cannot take the disk out and put in a new one. This means that making a copy of the information that you have stored on a Winchester cannot be done without another high capacity storage device – and this costs a lot of money. Most users settle for copying important files from the Winchester to a number of floppy disks. If you have a 1M floppy then backing up a 10M Winchester takes 10 disks, a .5M floppy takes 20 disks and so on. This is such a time consuming and fiddly exercise that many users fail to backup often enough – a surprising number trust their valuable data to luck and never backup their Winchester.

You can buy cartridge tape backup devices but these cost around £800 and they cannot be used for general file operations – their sole use is backing up the Winchester. This is a crazy situation, where a reasonable backup to a Winchester now costs more than the Winchester itself! As Winchesters continue to become cheaper and their capacity higher someone has to come up with a good low cost alternative backup system sooner or later. (Since it is fixed, not even another Winchester is a suitable backup for a Winchester!)

Even though Winchester disks bring problems of their own there is no doubt that they are very attractive propositions. The 10M 5¼" Winchester has virtually become the standard because of its use in the IBM PC (upgraded) and the IBM XT. However the 3½" 10M Winchester currently looks like a strong contender for the future standard (see the Apricot MX10).

Winchester disk prices are hovering at around £1000 for a complete 10M system. If you look at this as £100 per 1M of storage this is comparable with floppy prices. It is not impossible (looking at current raw hardware prices) that this could come down to £500 by the end of the year.

supplier	machine	price	capacity	O/S	notes
Midwich	BBC	850	5M	MWFS	suitable for Econet
Midwich	BBC	POA	10M	MWFS	suitable for Econet
Midwich	BBC	POA	20M	MWFS	suitable for Econet
Apricot	F1/F1e	900	10M	MS DOS	3½" drive
Microware	IBM PC	799	20M	MS DOS	includes free fitting
Digitask	IBM PC	822	10M	MS DOS	includes power supply
Digitask	IBM PC	1002	20M	MS DOS	includes power supply
Logitek	MBC550	1200/2445	10/40M	MS DOS	internal and external types
CST	QL	1200	10M	QDOS	includes psu, interface, controlling software (QDOS device driver) utilising SW for backups

COMMS NEWS

More gossip, news and essential information from our man in the switching system.

Cheap gossip gets an upgrade

PLINK or Compuserve users will be familar with the delirious joys of online CB emulators providing gossip to anonymous world-wide users – and the morning-after effect when the bills come in.

Very sensible of Micronet, therefore, to up-grade its slow but cheap Chatline service with a real-time, multi-channel CB emulator, part of which will be open to all Prestel subscribers.

Users will soon be able to choose from 10 channels, each with its own theme. Two of the channels will split the Prestel page into three or four sectors, each containing a message, with auto-refresh of the sectors to provide an automatic and continual updating of messages displayed.

There'll be no archive of earlier material on these auto-refresh channels, but the remaining eight – which conform to the present page-oriented Chatline format – will retain the handy archive feature, though continuing uncertainties about legal liability for these unsupervised areas seems likely to reduce its size to well below the present 200 frames. Users of the paged channels will still have to press a key for the next message, although real-time operation should mean that there'll always be one ready and waiting.

Micronet expects one of the channels to concern itself with computing topics, and another with current affairs, but beyond that they're sitting back and hoping users themselves will set a tone for individual channels, with the kind of self-policing of dissenters already familiar from ordinary Chatline.

Four of the new channels will be reserved for Micronet members, with the remaining six – including an auto-refresh channel – being open to all Prestel subscribers, probably with a higher charge attached.

The Chatline up-grade will run on new software developed by Prestel to Micronet specs, and provides for continuous polling of the Pandora messaging centre (where all Prestel Email is sorted) by the Duke editing computer. Chatline messages drawn off Pandora are then reformatted by Duke and squirted out to the scattered Prestel computers for display on the various channels.

The general access Chatline areas (we can reveal) will form part of the still-secret Buttons 700 project, which Micronet is developing to capture the audience of bored secretaries and travel agent clerks presently running up their boss's Prestel and phone bills on the competitions, quizzes and saucy gossip provided by IPs like Baric.

Few details of the Buttons area have yet emerged beyond the crucial three factors of Entertainment, Open Access and Frame Charges, but this observer will hazard a wild guess that (a) it will do well, and (b) its auto-refresh Chatline channel will instantly become Adults Only.

Mending the holes in Starnet

Micronet subscribers with long memories may recall the Starnet interactive strategy game that was one of the first games to go live on the 'net. When launched the game was described as having the potential to support 'over 500 simultaneous players'. It was also billed as being 'great fun to play' – and so it was if players enjoyed the accessing problems that plauged the game. Problems with the software apart, the game had the potential of being a popular part of the Micronet service.

Recently it was decided to attempt to revive the game and the job of rewriting the software was given to Mike Brown, the technical manager. While Mike was thinking of how to approach the not inconsiderable task of implementing Starnet, Micronet received a mailbox from one Lawrence Kirby. It appeared that Lawrence had been so dissatisfied with the initial implementation of the game that he had decided to rewrite the software – more as an exercise in programming than anything else. As he developed the software though he realised that if Micronet were to use his program they could revive Starnet – hence the mailbox.

According to Mike, 'A lot of kids think they are ace programmers, but when I went down to see Lawrence it became obvious that this was, indeed, a brilliantly written piece of software.'

Starnet will be back in action from November though those who registered for the early version of the game will have to register again. As an incentive to players of the game, anyone who achieves the status of EMPYR (Emperor) will get all of their moves free – until that is they are overthrown and booted out to start again.

Top IP considers quitting Prestel

Reliable info reaches us that prominent Prestel Information Provider Timefame International is considering saying bye-bye to BT.

Timefame, which boasts a healthy 1.5 million page accesses per month, has never felt the same about BT since its temporary suspension from the system for allegedly breaking the IP contract (which forbids 'bringing Prestel into disrepute') with its allegations in the wake of the Duke of Edinburgh hack that a mole high up in Prestel management was providing helpful hints to would-be interlopers.

Timefame was doubtless talking out of its RS port on that occasion – the DoE hackers themselves have assured us that the carelessness of an engineer was the only help they got or needed from Prestel. Nevertheless, the affair still left a nasty taste with many observers, who felt that – whatever the pressure from BT management – Prestel should stick to its original role of passive carrier (if necessary forcing a retraction from Timefame through legal action) rather than turning into the heavy-handed censor.

Anyway, it seems that grudge-holding Timefame are plotting to close their Prestel pages and transfer operations to a (still secret) independent computer network with pseudo-scrolling, no subscription or computer time charges, and 65% local call access.

Even if the new network can't generate enough advertising revenue, say our informants, Timefame will run at a loss.

STOP PRESS

As we close for press, Timefame have announced that they may not withdraw from Prestel, at least for the present.

Bulletin boards for Spectrum

The comms equivalent of painting pictures on a pinhead has arrived in the form of bulletin board software for the Spectrum.

The software, by comms fanatic Nicholas Goodhall, enables a 48K Spectrum with a couple of microdrives to store over 100 pages, run response and closed-user frames, handle viewdata-style colours and graphics, and even provide downloadable telesoftware.

The 1200 baud transmit rate is up to Prestel standards, but – thanks to the way each page is stored on a separate microdrive file – access to individual pages can take up to seven seconds.

Software to access these Spectrum bulletin boards is downloadable from the Spectacular area of Micronet, and full details of the system are provided on Nicholas's Gallery frames.

Half a dozen comms fanatics scattered throughout the UK have already turned themselves into Spectrum sysops, including Nicholas Goodhall himself. But be warned: precious few callers will be able to access Nicholas's system at local call rates. His home, on the Isle of Lewes, is closer to Stockholm than to London!

MICRO VIEWDATA

Local databases using viewdata technology and the BBC micro graduate from the classroom. Ian Burley looks at the new Micro Viewdata system.

'Videotex' is computer jargon referring to special forms of computer databases: namely 'teletext' and 'Viewdata' systems. Teletext is transmitted via spare television broadcast scan lines and is decoded and displayed on modified teletext TVs. Featured on the UK's teletext system are the BBC's Ceefax and ITV's Oracle services. Viewdata is superficially similar to teletext: both use practically the same full colour 40 column alpha/mosaic character displays, and it's very easy to confuse the two at a glance.

A fundamental difference between viewdata and teletext is that the latter is only capable of *displaying* information whereas viewdata is *interactive*. As well as being able to read pages of information, viewdata users may also send and receive messages or even edit pages. Viewdata is two-way!

British Telecom's Prestel system is the UK's major national viewdata network and offers around 350,000 pages split into many independently run Information Providers (IPs), eg, Micronet 800, which caters for microcomputer users, and Citiservice, which serves the Stock Exchange/banking community.

Until recently, the only viewdata systems to be found were quite large affairs running on mini or mainframe computers and only accessible if you had an account and password with a suitable terminal and modem to access the system via telephone.

LOCAL BULLETINS

The advent of small but powerful computers like the BBC micro with low cost auto answering modems suddenly opened up new possibilities for 'mini' viewdata systems. Small single line 'local' viewdata bulletin boards are now popping up all over the place.

Educational and training based establishments like ITECs (Information Technology Centres) and the MEP (Microelectronics in Education Programme) dabbled with useful, if rather limited, teletext emulated database programs for use in class rooms – with the MEP's 'Edfax' system a popular choice.

Not satisfied with the limitations of the teletext based Edfax system, the MEP has developed its own 'Mini Prestel' viewdata system designed mainly for school children and their teachers to design, build and edit their own structured databases in the class room. The final result – Micro Viewdata – is now marketed in conjunction with the MEP, by Tecmedia. Along with the Micro Viewdata package, Tecmedia also supplies an optional online viewdata terminal emulator, originally designed to CET (Council for Educational Technology) and Prestel Education specifications.

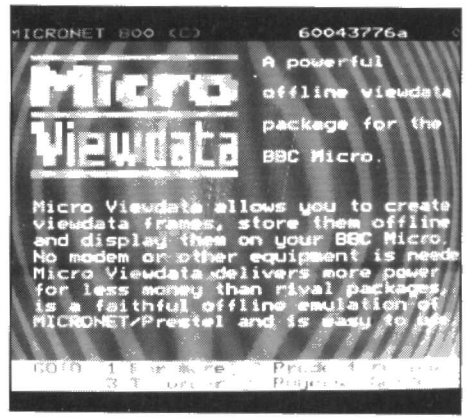
Micro Viewdata is modelled closely on the pukka Prestel system. Page layout can be identical to those on Prestel and frames can be grabbed from Prestel or other on-line viewdata systems and stored in a 'jotter' file. Frames stored in a jotter can be conveniently incorporated into a local database using Micro Viewdata.

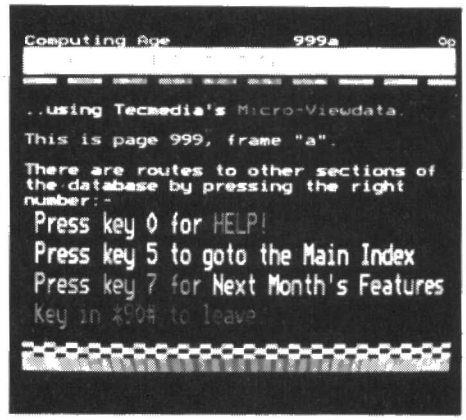
Just like Prestel, pages created can have numbered routes (0 to 9) to other specified pages. This powerful feature enables a comprehensive database design to be planned, with frame routing often becoming a task requiring much skill to accomplish an elegant database layout.

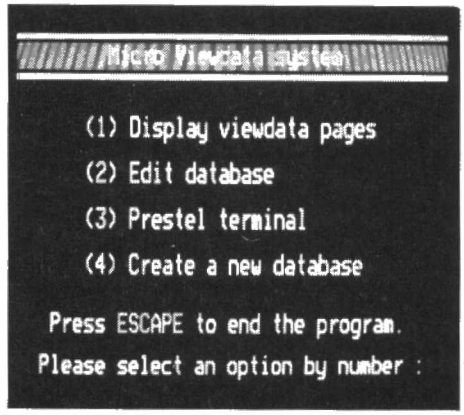
Micro Viewdata incorporates a sophisticated frame editor featuring all the usual editing facilities (rather like a wordprocessor) such as insert/overwrite, graphics, double height, concealed characters, etc. On top of this, a windowing 'cut and paste' facility enables chunks of text or graphics to be moved around the current frame being edited or even to another frame entirely.

OPTIONS

Several levels of menu options are at the heart of Micro Viewdata. Booting the disk in normal BBC fashion (Shift & Break) brings up a drive selection prompt (drives in use between 0 and 3) then the main menu appears. A demo database acting as a viewdata tutorial is supplied and can be accessed by selecting option 1. Otherwise







Setting up local Viewdata: Top, a ready-made example of an introductory screen. Centre, a user-defined menu. Above, The Micro Viewdata menu.

'Frames can be grabbed from Prestel or other on-line viewdata systems and stored in a jotter file'

a new database can be created after keying 4.

The user is asked the maximum number of frames the database must hold. Up to 85 frames can be stored on a 40 track single sided disk. A pair of 80 track double sided drives can hold 760 frames. I don't see any reason why most double density disk systems shouldn't increase the maximum frame capacity to well over 1000! Each frame, with 'frame table' routing data, is stored in a random access file created once the number of frames required has

been entered. Therefore there are no Acorn DFS 31 file limitation problems although initialising a large file (100 frames or more) will take several minutes as the disk drive chugs away!

After creating a new database, all you have is an empty shell waiting for frames to be designed, entered and routed together. Selecting option 2 from the main menu produces the Editor menu. Firstly, the right database must be selected via option 5. Before it can be edited, a frame must be created (option 2). A page number is requested and if it's a previously unused page, the 'a' frame (eg 8001154a) of that page defaults to edit.

Though in some ways the most impressive part of Micro Viewdata, the frame editor also has some idiosyncracies, especially for experienced viewdata editors. There is no option to enter normal viewdata escape codes to get at colour and graphics. Everything is controlled by the BBC's function keys. A beginner would find no problem with this but I certainly found it difficult to use compared to other BBC viewdata editing packages.

A coloured function key prompt strip is supplied and on-screen status lines at the top and bottom of the screen keep the user well informed. The cursor position, character at the cursor, state of text/graphic toggle, insert/overwrite toggle, graphic pixel mosaic shape are shown. As with most other editing packages, graphic pixel blocks can be shaped by pressing keys in the Q,W,A,S,Z,X block with 'E' to enter the chosen graphics character.

CUT AND PASTE

Rare, if not unique, in a budget priced viewdata editing package is the windowed 'cut and paste' facility. Marking the top left and bottom right corners of a rectangle on the frame being edited creates a window which can be highlighted and, if needed, stored in a buffer. The highlighted window can then either be moved or duplicated to a different part of the screen or held over to be positioned on another frame. An extremely handy facility! Unfortunately, triple height (or even quadruple height as offered in some editors), another useful feature, isn't implemented.

After a frame has been completed, required routes or 'links' to other frames can be incorporated as part of the frame-save process. This involves filling the 'frame table'. If you leave an option to press key 5 to look at page 8000201, entry 5 in the frame table (unseen by readers) must have page 8000201 entered. A strict routing option is provided, whereby all the routes on a certain page are automatically set to that page's own number plus one for route 1, plus two for route 2, etc.

Back at the main menu is the option (No. 1) to display viewdata pages. If a page zero exists then the display will start from there. As with Prestel etc, you can go directly to known pages by keying *<framenumber># from any page. Otherwise you can simply follow the numbered routing as the database editor has mapped it out. Just key the digit to where you want to go. The back-arrow key will retrace your steps as far as the last three frames.

'Unique in a budget priced viewdata editing package is a windowed cut and paste facility'

Certain pages have special functions. Page 99 is designated to a jotter file if present. A jotter file is a mini database of its own with temporarily stored frames (usually a maximum of five) which have been 'jotted' down from another database either on or off-line. As jotter files are in the correct FIF (File Interchange Format), they can be treated as a branch of the currently selected database. A jotter file can also be copied to a database and routed very easily.

Page 910 is the universal entry page to the frame editor.

Page 950 selects the on-line viewdata terminal if present.

Page 952 lists all frames in the database.

Page 90 exits the program (equivalent of logging off).

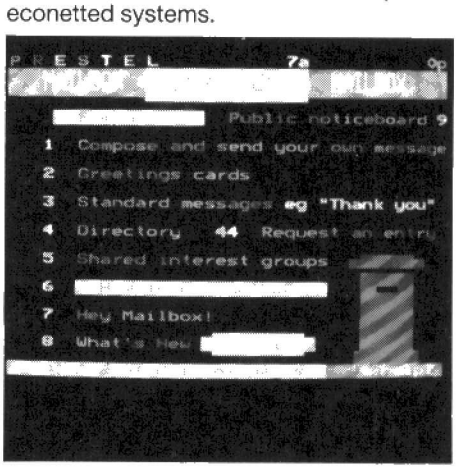
CAROUSEL

Another feature of Micro Viewdata is a timed carousel display program. A series of frames can be selected by page number and each can be set to stay on view for a number of seconds. Entering *960 from accessing the database invokes the carousel – a useful automatic tour of specific parts of a database for special occasions, exhibitions, etc.

Supplied separately by Prestel Education, but usable as a Micro Viewdata module, the on-line terminal emulator is one of the best currently available for the BBC. It is produced by Softmachinery and is a development from a line of famous implementations (Micronet Version 4, Acorn Prestel ROM, Tandata Tango, etc). Main addition to this version is the load/save jotter facility for transferring captured frames to a local database via the FIF format.

Softmachinery's Prestel terminal is excellent for a number of reasons including frame: tagging (the ability to remember selected frame numbers and recall them when needed), an excellent on or offline mailbox or frame editor, send frame facility (screens can be loaded from disk and sent character by character – at 75 baud – to the message or other frame being edited), excellent on-screen help menus, and extensive configuration modifications possibilities – which are extremely well documented.

Although Tecmedia mentions that an econetted version of Micro Viewdata is under trial, it would have to be extremely good to match rival Communitel's established up-market (and much pricier) systems. Indeed there are signs that co-operation between the two might bring product rationalisation, with Tecmedia going for the classroom and expanding home markets, and Communitel the larger 'host' (modem connected) dial up and econetted systems.



Data

Micro Viewdata
Supplied for BBC micro by Tecmedia Ltd, 5 Granby Street, Loughborough LE11 3DU, on 40 or 80 track disk. Price £32.06 inc. p&p and VAT (£21.64 after educational discount).

Prestel Education Viewdata Terminal Emulator
Supplied for BBC micro by Prestel Education, Telephone House, Temple Avenue, London EC1, on 40 or 80 track disk or ROM. Price £19.95.

In brief

- Tecmedia's Micro Viewdata system is a fine database package for schools and similar environments.
- Tecmedia say it is suitable for children as young as nine years: a nine year old wouldn't find it easy to do much editing, but would be capable of finding his or her way around a database after a short while.
- Older children and adults should find the system fascinating to use, especially for set projects and so on – actually managing to design and construct a sizeable database with good routing and design can be very satisfying!
- Micro Viewdata's frame editor is one of the most comprehensive I've seen, despite its non-standard commands. The cut and paste facility makes all the difference!
- The Prestel Education Terminal Emulator is excellent in its own right.
- Reviewing software like Micro Viewdata just reinforces my feeling that I was at school 10 years too early!

A PORTABLE BBC

Reluctant to spend rare summer days glued to a terminal, Clive Williamson persuaded a portable to talk to his BBC micro, and headed for the Great Outdoors.

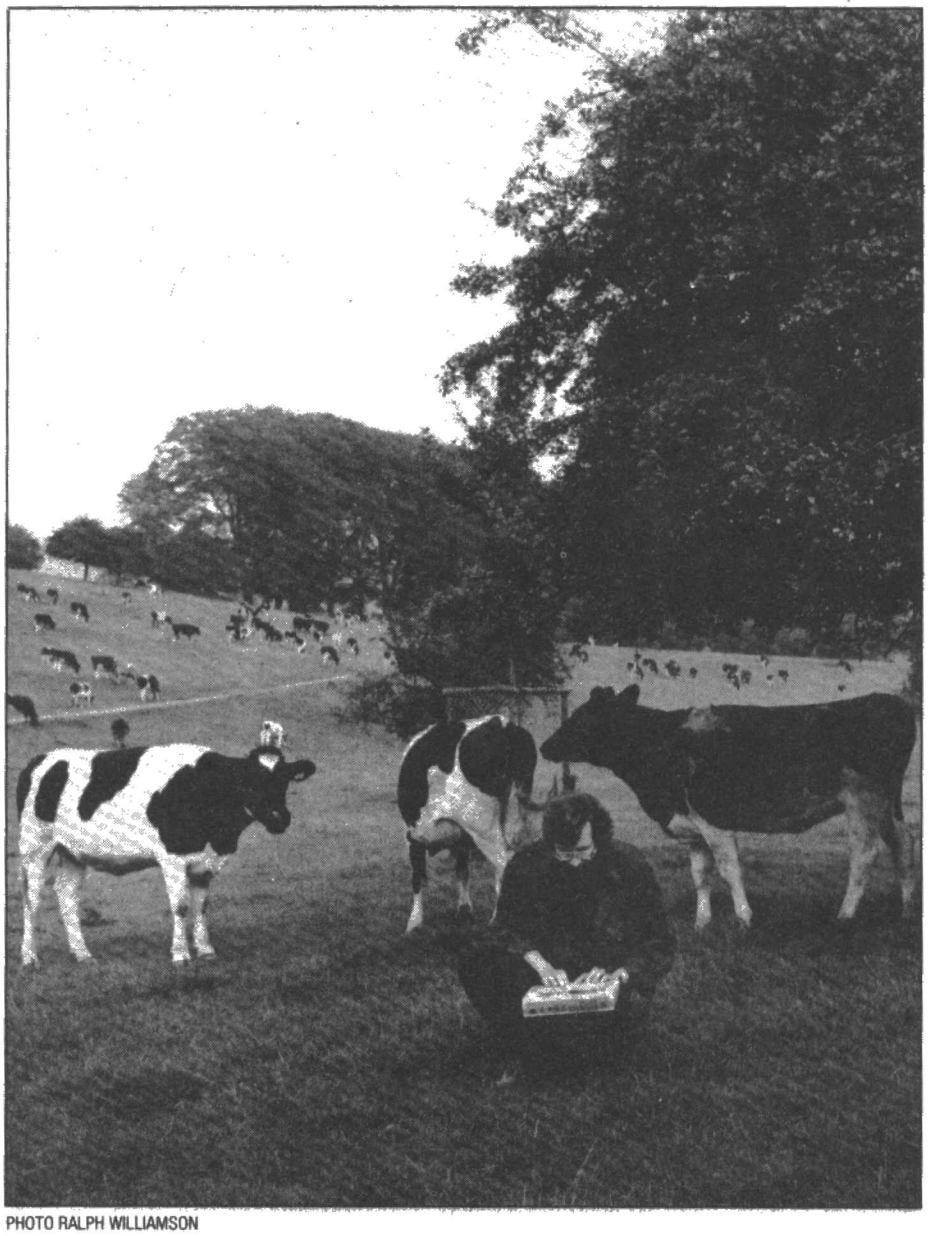


PHOTO RALPH WILLIAMSON

Some lap-held micros can be picked up at very reasonable prices, and I decided to concentrate on two models: the Tandy TRS80 Model 100 and the NEC PC-8201A. The two are very similar, being based on the same basic design by Kyocera. Both machines are light, weighing in the region of 4.5 lbs with batteries, and have large easily-read 40 column LCD displays. Both also have simple but effective text processing software built in, as well as terminal software which enables ASCII files to be sent to a modem or another micro via their RS232 ports.

All that was required to make the project work was a suitable cable to run from the chosen portable to my BBC B at home, and some software at the BBC end to accept incoming text. Ultimate flexibility required the system to work in both directions, so that text files could also be passed back from the BBC micro to the portable for further work 'in the field'.

COMPUTING ON THE MOVE

The more expensive portables now offer large memory capacity, 80 column displays, and the ability to run standard software like Wordstar, but the highly cost-effective Tandy and NEC models are lighter and simpler in operation albeit with a reduced memory capacity. In addition to the Text processor and terminal software, both machines have Basic built in, and the Tandy has extra schedule planner and address database software. All these programs are permanently fitted in ROM, taking the minimum of space and fuss. The NEC has slightly cheaper memory upgrades than the Tandy, and the added option of battery-backed RAM packs for extra data storage.

I chose the NEC for the field trial, and a whole range of possibilities immediately opened up – writing on the London Underground on the way to appointments, and nearer home, in Kew Gardens to work there in peace and quiet at the first sign of sunshine. The 40 character screen was easily legible in strong light, by virtue of a thumb-wheel control on the side of the machine to adjust the display for different viewing angles. Being an LCD display, there was no flicker, and no unhealthy ion stream either. The full-sized keyboard had a slightly limp action (rather like the Electron's) on both models, although this presented no real problem in practice – if anything it reduced my mis-keying. A nice touch on the NEC keyboard is a small raised pip on the F and J 'home' keys for touch typing. One reason for choosing the NEC machine was that its key layout is very similar to that of the BBC micro.

Battery life using Mallory Duracells was about 18 hours of intermittent use with a 32K machine, and as a cheap mains adaptor is available, there was no need to waste battery power when using the machine back at base. A possible use for a portable of this type would be to take notes at meetings and conferences, but a fast typist would probably run out of memory quite soon – the machine's operating system takes about 4K of RAM, leaving 28K on the 32K version, enough for about 4000 words. (Data can be saved to a cassette recorder

at any time though.) When the machine is switched off, the RAM contents are maintained by trickle-charged NiCAD cells fed from the main batteries. According to the manufacturers' specification, a 16K RAM model will sustain memory for 'up to 30 days', but this is considerably reduced on a 32K machine.

TRANSFERRING TEXT

Once the machine's memory was full or the work at hand was finished, there were three alternatives. Away from base, the text could be saved on a standard cassette recorder using the built-in 1500 baud cassette interface, or files could be sent or stored on electronic mail using a modem or acoustic coupler and a telephone call. When working in the garden or near to home, I hooked up to the BBC Micro for a file transfer. Using the lead and software described below, completed text files could be 'spooled' from the portable to the Beeb, ready to be finely edited, formatted and printed using the View word processor (Wordwise Plus will also do the job). The software and cable details given here are for the BBC system, but a similar setup should work for any other computer with an RS232 compatible interface and suitable terminal software.

Steve Lowry's 'mini-terminal' software for the BBC (given below) transmits or receives text files as a stream of ASCII characters. In the incoming mode they are

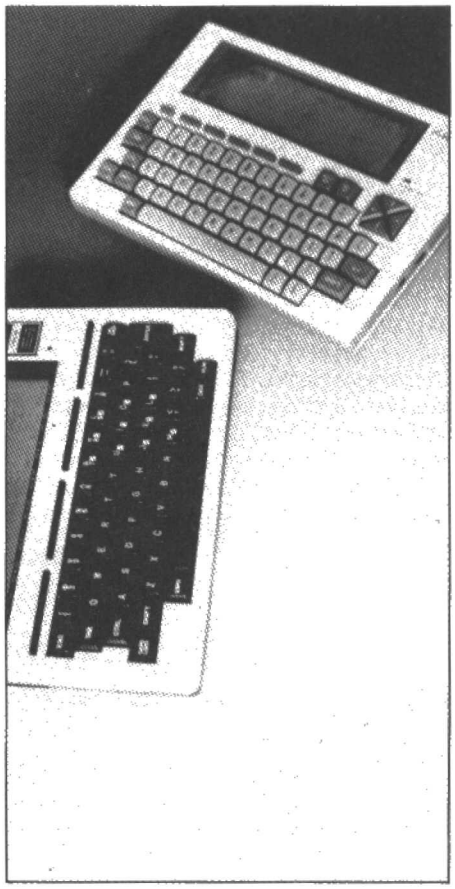
'All the software is permanently fitted in ROM, taking the minimum of space an fuss'

*SPOOLed to a disk file, from where they can be pulled into VIEW using the READ command, and subsequently worked on. This is quite straightforward, but to make text ready for transfer in the opposite direction, a little more juggling is required. First prepare a version of the text using a 40 character ruler, so that it will fit the portable's screen exactly. Then set LM,HM, TM,FM and BM all to 0, and delete any headers and footers. Save a copy of this new file onto disk (being sure to give it a new file-name: we will call the file TEXT). Next, the TEXT file has to be re-saved to disk using *SPOOL, to create the necessary ASCII file as follows:

```
*SPOOL NEWFILE
SCREEN TEXT
*SPOOL
```

We could send NEWFILE through the mini-terminal software at this stage, but files spooled from VIEW contain a lot of unwanted material – carriage returns, the VIEW command page header and so on – so the best thing is to tidy the file up as follows. Type NEW to empty the memory, then use the command READ NEWFILE to re-load the text. Use the DELETE LINE function key to delete any unwanted material, then use the SAVE command to save the file under same name. The file is then ready for transmission. Running the mini-terminal software in the send option, you will be asked for the name of the file to be *EXECed to the lap-held machine and the ASCII stream will be sent via the RS232 interface.

Left The Tandy TRS80 Model 100 and NEC PC-8201A.



Using Wordwise

If all this sounds too complicated users of Wordwise and Wordwise Plus will be thrilled to know that the procedure is much easier for them. To prepare a file to be sent, simply set the line length to 40 characters by entering <f1>LL40<f2> at the beginning of the document, then save a version of the text using the Spool Text option (8) from the main menu. Next, go into Basic to run Steve Lowry's software as before. A file which has been sent from the portable and spooled to disk can be read directly by Wordwise using options 2 or 4 from the word processor menu.

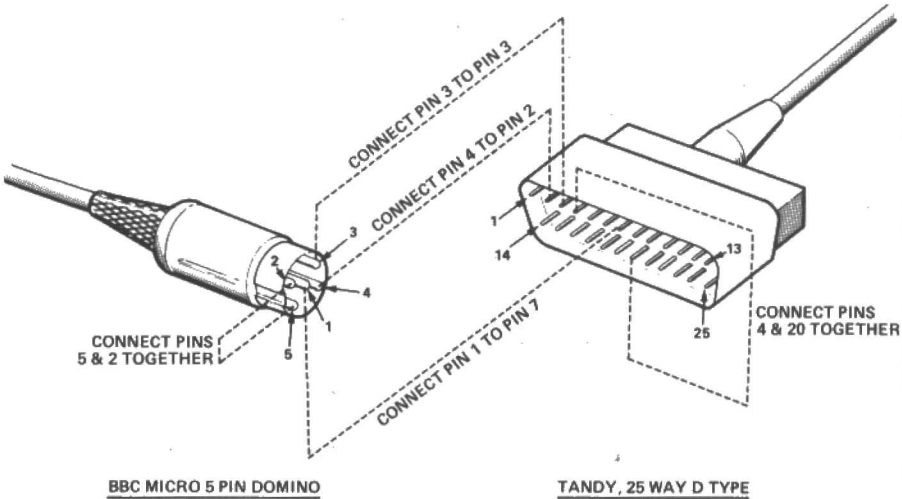


Figure 1. Serial connection between BBC and Tandy.

REFINING THE SYSTEM

Users who already own terminal software for their BBC micros don't need to key in our mini-terminal program. They will be able to carry out data transfers with their chosen lap-held micro simply by making up the RS232 cable, and using 300/300 Baud operation to match the terminal modes normally set on the portables. Software such as Computer Concepts TERMI II (£33.35) or COMMUNICATOR (£69.00) is perfect for the task, as both have very easy control over sending and receiving files using the BBC micro's function keys. A third alternative is COMMSTAR from Pace (£34.00) which also includes the ability to access Prestel-type databases. All three are sold as plug-in ROMs for the BBC.

Improvements can be made at the other end of the set-up. Various text formatters are around for both the NEC and Tandy machines, but these are mainly helpful when you have to print directly from the portable rather than formatting and printing out from a larger machine back at base. What could be handy though, is a utility from Microtime International Ltd called T-VIEW 80. This can convert the usual 40 character display of the NEC or Tandy to

'The BBC terminal software transmits or receives files as a stream of ASCII characters'

show a 60 character-wide window on 80 column text. It would be useful if text has to be laid out specifically for an 80 column print-out. One snag is that squashing the extra characters onto the screen does decrease legibility. T-VIEW 80 is supplied on cassette for around £35. An extra which may appeal to NEC users is their 32K battery-backed RAM cartridges, which plug into the left hand side of the PC-8201. These are extremely useful, but expensive at £195 each, plus VAT.

Terminal software

This program has been written to allow the BBC micro to communicate directly with other computers via an RS232 link. It was written for use with the Tandy 100 style of portable computer. With one lead (details given below) and this software, ASCII files may be transferred between the two machines. The 'remote' Tandy should be selected to:

a) TELCOM (from the main menu)
b) Stat (f3)
c) 3711E
d) Term (f4)

The NEC PC-8201 requires a 'Stat' setting (f4) of 3171XS before choosing the Term option (f5). With the software running (1) keypresses on the BBC keyboard will appear both locally on the BBC micro screen output and as RS232 output to the portable machine. (2) Keypresses on the Tandy keyboard will appear as characters on the BBC micro.

To LOAD A FILE TO THE BBC MICRO FROM THE TANDY:

a) Select 'f0' on the BBC
b) Enter a file name for the received data to be saved under. (on the BBC machine)
c) Send the file from the Tandy ('f3', 'file name', on the Tandy)
d) When the transfer is complete, hit 'f9' on the BBC.

The software asks for line width when a file is to be uploaded: enter 75 to match VIEW's Mode 3, or 40 if using Wordwise.

To SEND A FILE FROM THE BBC MICRO TO THE TANDY:

a) Select 'f1' on the BBC – A disk catalog should result
b) Enter the name of the file you want to send
c) Prepare the Tandy to receive the data and download it ('f2', 'file name', on the Tandy)
d) Hit 'space' on the BBC to begin sending.

Remember this software is intended for ASCII files only. Some word processor data files and tokenised Basic files contain non ASCII characters which cannot be sent in this way. These files must be spooled to disk before being sent.

Mini-Terminal

```
LIST
   10 MODE 7
   20 PROCsetup
   30 PROCchoice
   40 PROCcomm
   56 REPEAT UNTIL 0
   60 :
   70 END
   80 DEFPROCsetup
   90 ON ERROR GOTO80
  100 *DISC
  110 S=FALSE
  120 DIM cli 40
  130 *FX18
  140 *KEY0 !M
  150 *KEY1 !M
  160 *KEY9 !M
  170 *FX2,2
  180 *FX7,3
  190 *FX8,3
  200 osbyte=&FFF4
  210 oscli=&FFF7
  220 oswrch=&FFEE
  230 DIM send 100
  240 DIM v 1
  250 DIM y 1
  260 DIM t 1
  270 PROCassem
  280 ENDPROC
  290 DEFPROCkey
  300 SOUND1,-15,200,2
  310 REPEAT UNTIL INKEY(-99)
  320 REPEAT UNTIL NOT(INKEY(-99))
  330 ENDPROC
  340 DEFPROCcli(A$)
  350 $cli=A$:X%=cli:Y%=cli DIV256:CALL
oscli
  360 ENDPROC
  370 DEFPROCchoice
  380 PROCclear
  390 FORT%=1 TO 6:PRINTTAB(0,T%);:VDU13
2,157,135:NEXT
  400 PROCline(0)
  410 PRINTTAB(10,2)"ASCII TEXT SPOOLER"
  420 PRINTTAB(3,3)"Press:";TAB(4,4)"f0:
To load a file to the BBC micro"; TAB(4,
5)"f1:To send a file from the BBC micro"
  430 PRINTTAB(4,6)"f9:To 'stop' either
of the above"
  440 PROCline(6)
  450 PROCwin
  460 ENDPROC
  470 DEFPROCcomm
  480 REPEAT
  490   REPEAT
  500     IF ADVAL(-1) > 0 AND ADVAL(-3)
>0 THEN ?y=GET:CALL send
  510     *FX2,1
  520     IF ADVAL(-2) THEN ?v=GET:CALL
screen
  530     *FX2,2
  540     UNTIL INKEY(-33) ORINKEY(-114
)ORINKEY(-120)
  550   IFINKEY(-33) THEN PROCspool
  560   IFINKEY(-114) THEN PROCexec
  570   IFINKEY(-120) THEN PROCclose
  580   UNTIL 0
  590 ENDPROC
  600 DEFPROCline(W%):PRINTTAB(0,W%):FOR
t%=0 TO39:VDU255:NEXT
  610 ENDPROC
 1270   CMP#9:BNEe:RTS:.e
 1280   LDX#00:.loop:STX t
 1290   CMP t:BNEf:LDA#32:RTS:.f
 1300   INX:CPX #32:BNEloop:RTS
 1310   RTS
 1320   ]
 1330   NEXT I%
 1340 ENDPROC
  620 DEFPROCwin:VDU28,0,23,39,8:ENDPROC
  630 DEFPROCexec
  640 *FX15,0
  650 PROCwin:CLS:*.
  660 PROCclear:VDU26
  670 PRINTTAB(12,2)"EXEC FROM BBC":F$=F
Nfile
  680 VDU26:PRINTTAB(4,4);"Prepare remot
e end to receive"; TAB(4,5);"THEN hit 's
pace'"
  690 PROCkey
  700 PROCwin:CLS
  710 PROCcli("*EXEC "+ CHR$34+ F$+CHR$3
4+ CHR$13)
  720 PROCchoice
  730 PROCwin
  740 ENDPROC
  750 DEFPROCspool
  760 *FX15,0
  770 S=TRUE
  780 PROCclear
  790 PRINTTAB(12,2)"SPOOL TO BBC DISC":
F$=FNfile
  800 VDU26
  810 PRINTTAB(4,4)F$;" is now ready for
 input."
  820 PRINTTAB(4,5);"The remote end shou
ld now send text"
  830 PRINTTAB(4,6);"Hit'f9' when this '
send' is complete"
  840 PROCcli("*SPOOL" + CHR$34+ F$+CHR$
34+ CHR$13)
  850 PROCwin
  860 ENDPROC
  870 DEFPROCclear:VDU28,3,6,39,2:CLS:VD
U26:ENDPROC
  880 PROCclear:VDU28,4,6,39,4
  890 IF ERR=17 THEN RUN
  900 REPORT:PRINT"- Press Space":PROCke
y:CLOSE#0:RUN
  910 DEFFNfile
  920 PRINTTAB(4,4)"Please enter the fil
e name :";
  930 REPEAT
  940   SOUND1,-12,190,2
  950   VDU28,4,6,39,6:INPUT""F$
  960   UNTIL LEN(F$)<>0
  970 =F$
  980 DEFPROCclose
  990 IF S=TRUE THEN *SPOOL
 1000 IF S=FALSE THEN CLOSE#0
 1010 PROCchoice
 1020 ENDPROC
 1030 DEFPROCassem
 1040 FOR I%=0 TO 2 STEP 2
 1050   P%=send
 1060   [OPT I%
 1070   LDA y
 1080   JSRfilter
 1090   TAY:STA t
 1100   JSR oswrch
 1110   LDA#138:LDX#2
 1120   JSRosbyte
 1130   LDY t
 1140   CPY #13:BNEok:LDY#10:JSRosbyte:L
DA#10:JSR oswrch:.ok
 1150   RTS
 1160   .screen
 1170   LDA v
 1180   JSRfilter
 1190   JSR oswrch
 1200   CMP#13:BNEok2:LDA#10:JSRoswrch:.
ok2
 1210   RTS
 1220   .filter
 1230   CMP#13:BNEa:RTS:.a
 1240   CMP#8:BNEb:RTS:.b
 1250   CMP#10:BNEc:RTS:.c
 1260   CMP#11:BNEd:RTS:.d
```

Contacts

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Tel: (0442) 63933

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A LESSON IN SYNTAX

Everybody uses Basic, however much the machine code prodigies may protest. So for the fallible multitude Warren Lake has compiled a simple guide to interpreting syntax errors in five common dialects.

One of the first lessons learnt when using a computer is that whilst the machine may well be infallible, the programmer is most definitely not. Whether we type in listings from a magazine, write our own programs or simply run commercial software, one thing is certain. At some time an error or 'bug' will materialise. Its effect may vary. If you're lucky it will be instantly identifiable causing the program to crash or something similarly spectacular. If you're unlucky, it may remain hidden for a considerable period of time subtley corrupting information stored within the computer.

Whatever a bug's effect, once discovered its a good idea to track down the offending line or lines of code and, if possible, correct them. Here we assume that programs are written in Basic and as a consequence may be corrected.

Syntax errors are picked up by the computer's built-in interpreter either as commands are typed in or when a program is run. In general a message will appear on screen detailing the type of error along with a line number (where appropriate) indicating the point at which the program ceased execution.

This 'self-diagnosis' by the computer is useful in so far as it tells the user what to look for and where to look. Unfortunately, as error messages are inteded to cater for all circumstances they tend to be generalised and often ambiguous. Furthermore in many instances the line number reported and exact location of the offending statement do not coincide. As a consequence the user is called upon to take up where the computer leaves off and conduct his or her own investigation.

Before we examine some of the harder syntax errors to crack it's worth noting that most dialects of Basic (on the QL, version JS only) permit errors to be trapped with expressions such as:

```
ON ERROR GOTO
GOSUB WHEN ERROR
```

Here, when an error occurs, instead of crashing the program can be made to run a special routine. Typically these routines will either request that the user alter data input to the program or if the error is fatal, dump the contents of memory to a file so that the programmer may analyse and recover any data lost. However, whilst error trapping is useful on its own it usually only forestalls the inevitable.

OUT OF DATA

QL	EOF
BBC	Out of DATA
Amstrad	DATA exhausted
CBM 64	OUT OF DATA
MBasic	OUT OF DATA

Here a program will crash at a line that attempts to READ in more information than has been included elsewhere within the program. To correct this, first check that a "RESTORE line_no" command precedes the routine to READ the information in. This tells the computer which line within the program contains the start of the chunk of a DATA to be READ in. Omitting the command may result in a program either reading the wrong DATA altogether or else looking for DATA where none exists.

If the error persists then the most likely cause will be the omission of one or more DATA items from the group of statements pointed to by the RESTORE command. As most routines that READ data are loops the correct number of items can easily be calculated by multiplying the number of items READ in a single pass by the number of times the routine loops. This should be compared with the number of items separated by commas contained within a group of DATA statements. Of course, if it transpires that there is no omission, then the READ routine itself should be amended and number of times it loops reduced.

END OF FILE

QL	EOF
BBC	Eof
Amstrad	EOF met
CBM 64	Record not present
MBasic	Input past end

Similar to the previous error, the END OF FILE error arises from an attempt to read in more information than is in fact available. The distinction here is that the information comes from outside the program. For example from a file in memory or even from a program on another computer.

The first step here is obvious, that is to check the routine that reads in the information. One of the best ways of doing this is to compare it with the routine that writes it in the first place. One should parallel the other so that what goes out comes back in. If this fails to uncover anything then it may well be that the file containing the information has been subtley corrupted. If this is the case then a complicated program

Prevention not Cure

There are a number of simple rules of thumb which if followed will either dramatically reduce the number of errors you make or will enable you to nip them in the bud.

1 Construct programs in a modular fashion. Break a complex program down into its component parts and write mini-programs for each part. These should be self contained – if the particular dialect of Basic used is structured, allowing for user defined procedures, then all the better. Test each module separately by calling it from outside the program and varying the parameters passed to it. If possible endeavour to make any variables LOCAL to the procedure.

2 KIS – Keep It Simple. There is nothing wrong with clever algorithms except that they are by their very nature difficult to follow and extremely hard to debug. If you are going to optimise a program using such routines do so only after you are satisfied that it works without them and be sure to keep your original version.

3 Always document your programs.

4 Finally, if anybody else is to run your programs always assume that they have a mental age of six and that if anything can go wrong they will make it go wrong.

known as "patch" may be required to rebuild the file.

Where information is transmitted from a remote source it is often not possible to anticipate exactly how much of it there will be. For this reason most Basics permit the EOF error to be trapped so that the program will not crash reading a file of indeterminate length:

QL	IF EOF(£channel) THEN EXIT loop
BBC	REPEAT UNTIL EOF£(channel)
CBM 64	Not applicable
Amstrad	WHILE EOF+0
MBasic	Bad record number

FUNCTION CALLS

QL	Bad name
BBC	No such FN/PROC
Amstrad	Unknown user function
CBM 64	UNDEF'D FUNCTION
MBasic	Illegal function call

A very common (and thankfully very easily remedied) error is to fail to call a procedure or function by its proper name. For example, it is not uncommon to find that you have defined a procedure elsewhere within the program with name 'initialise' yet at the point where the error is reported have called it with 'initialize'.

NON EXISTENT VARIABLE

QL	Error in expression
BBC	No such variable
Amstrad	Syntax error
CBM 64	Syntax
MBasic	Syntax error

Another classic error is to fail to assign (ie a+1, c+a etc) a value or string to a variable, or forget to DIMension an array. As such items come into existence only when these operations have taken place this is tantamount to omitting them altogether. Typically this error occurs in a line where the variable or array name has been misspelt. To correct it the user will have to backtrack through the listing to determine whether assignment or DIMensioning did, in fact take place and if so, what the correct spelling should be.

Where a line contains references to more than a single variable or array the offending one may be identified by PRINTing the contents of each to screen immediately after the error has been reported and before the computer flushes the contents of the programs data area.

OUT OF RANGE

QL	Out of range
BBC	Subscript
Amstrad	Subscript out of range
CBM 64	Bad subscript
MBasic	Subscript out of range

When an array is DIMensioned, the programmer will specify how many items he wishes to store in it and, where strings are concerned, what the maximum size of each item will be. The computer then reserves the requisite amount of memory to accommodate this data structure. An out of range error occurs when an attempt is made to access more items than have been allowed for – ie the nth+1 item in an array DIMensioned to hold n items. The cure for this error is quite simply to locate the appropriate DIM statement and amend it so that the array will hold more items.

NB: If you have a QL – this error will also occur where an attempt has been made to PRINT an item whose X and Y co-ordinates lie beyond the bounds of a window. This may be corrected either by redefining the Character size so that it is smaller or increasing the size of the window.

OUT OF MEMORY

QL	Out of memory
BBC	Out of memory Too many GOSUBs/FORs/REPEATs
Amstrad	Memory full
CBM 64	Out of memory
MBasic	Out of memory

The out of memory error cannot be trapped and occurs when a program has used up the limited amount of RAM memory available to run applications programs. The amount used by a program includes not only the program lines themselves but any space reserved by the program during execution either to store information (variables, strings and arrays), manage external devices (buffers) or simply monitor the flow of control (heaps & stacks).

One cure for this error is to rewrite the program, optimising it so that the memory overheads are reduced. The most effective way of doing this is to check each floating point variable or array type to see whether it may be replaced by its integer equivalent. For example, using DIM array%(1000) instead of DIM array(1000) uses half as much memory. Obviously this may only be done when the intention is to store only whole numbers within a specific range (ie –/+32768).

Another way of reducing overheads is to see whether it is possible to re-use existing variables or arrays rather than create new ones. This can only be done where the computer does not access one of the two data structures at the same time.

In extremes it may be necessary to rethink the program altogether either by constructing shorter and more efficient algorithms so that it comprises less lines of code, or by splitting it into two or more separate programs which are then "daisychained together". The latter as an option is to be preferred but will only work on a computer where the data space is not automatically CLEARed when a new program is run.

So far we have assumed that a program runs "out of memory" because it is inefficiently programmed as opposed to intrinsically faulty. This, however, may not be the case. As already mentioned, space is set aside to control the flow of a program. If this flow is uncontrolled then memory may be eaten away very quickly. This situation usually occurs in programs where subroutines and procedures call themselves. In other words where recursion is employed.

Every time a procedure or subroutine is called the computer makes a note in a part of memory – known as the stack – of the point to which it will return when it encounters the end of the procedure or subroutine. If, say, a GOTO is used to jump out before this end is ever reached, then the computer continues to store information indefinitely. If procedures and subroutines are repeatedly called and never ended the stack will gradually fill up until it overflows. This situation is exacerbated if variables are declared LOCAL to a procedure as space will also be reserved for them until the procedure ends.

Even if you have a BBC which specifically reports this error, tracking down the offending procedure is difficult as the flow of control in a recursive program is seldom easy to follow. A simple way of monitoring its progress is to place a counter at the start of each procedure and one at its end, ie:

```
DEF PROC module1
start=start+1
.............
.............
finish=finish+1
END PROC module1
```

When the program crashes simply compare the values of the two counters. If a large discrepancy is found then the offending procedure will have been identified.

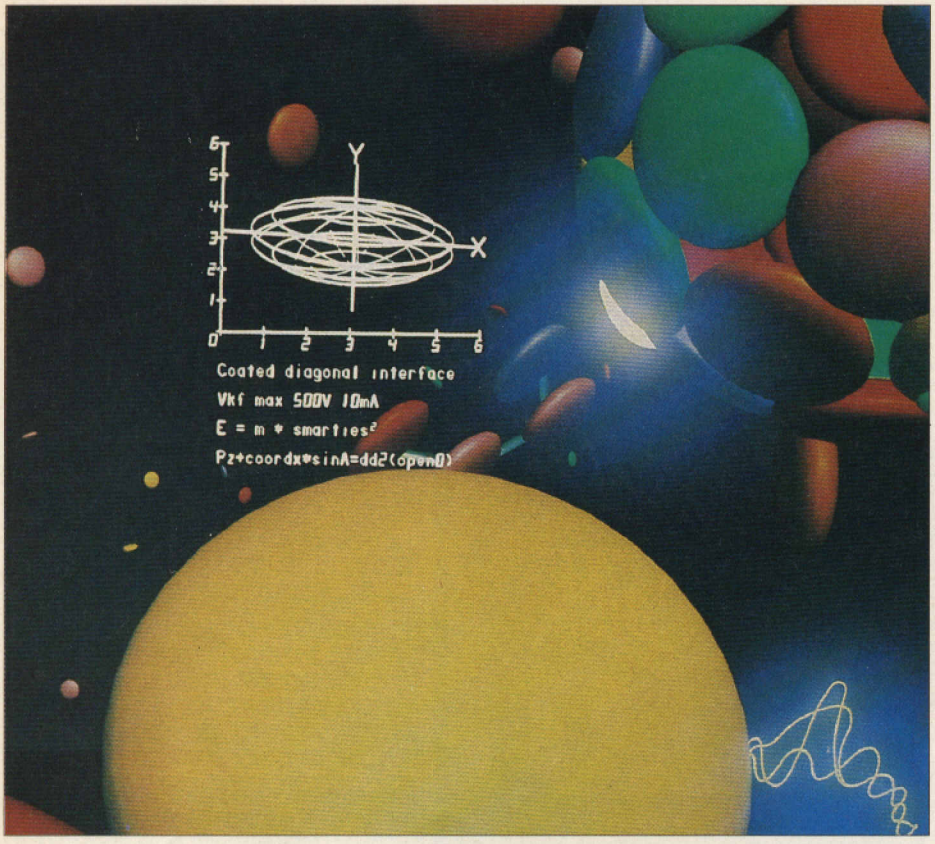
Logic Errors

The good thing about syntax errors is that they are picked up by the computer. Logic errors however are not. They are the 'sleepers' or 'moles' in a program. Their causes are as varied as their effects. It may be that a programmer has failed to cater for a certain set of inputs (ie the program is not idiot proofed). It may be that he has got his calculations wrong, such as charging a rate income tax at 130% instead of 30% in a PAYE program. Whatever the cause the errors have one thing in common: the computer does something that it was not intended to do.

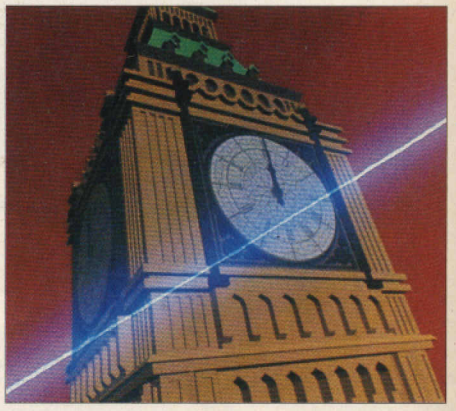
Like any good detective once the programmer is aware of the existence of a Logic error he tracks it down combining intuitive hunches with methodical analysis. Little can be said of the former which derive in part from previous experience in debugging and in part from an intimate understanding of a particular program's workings. Of the latter certain set procedures exist.

They are to run preset information through the program checking actual output against what was expected. Usually this gives some idea of what is effected by the error and on occasion where to look.

After this PRINT statements are inserted at strategic points in the listing which print out the values of variables or arrays that relate to the error. Once again the actual values that print out are compared against what is expected. Using this device it is possible to eliminate unaffected portions of the program and gradually whittle the possible source of the error down to one or two line of code. By then the error should be obvious.



TV special effects have come a long way since Fireball XL5. Alan Pipes went backstage to find out how such classics as the Channel 4 logo are constructed. Naturally he found a computer behind the clapperboard.



A COMPUTERISED KALEIDOSCOPE

The most whizzy TV special effects used to be 'all done with mirrors' – literally, the BBC's globe was until only recently a real one, turned by an electric motor, in front of a distorting mirror, watched by a simple camera – or, like the kaleidoscopic images behind the credits for Doctor Who, animated by moving a slit over artwork while a rostrum camera zooms in with its shutter open. Now it's all done with computer graphics.

It seems you can do virtually anything with computer graphics. From simple line animations in glowing green and 'inbetweening' – where a drawing breaks up into short lines and reassembles into something completely different – computer graphics has moved forward relentlessly over the past few years to cover everything from character generation to photographically real 3D animation.

There is a new breed of artist/programmer sitting often through the night at the keyboards of black boxes with names like Dubner, Quantel, Ampex and Bosch, making pop promos snappier than the last, station idents more hi-tech.

Never before have designers and art directors had more power and flexibility at their fingertips to fuel their imaginations. And imagination is getting to be a precious resource as computer graphics become commonplace, insidiously presenting the viewer with an expanded visual vocabulary that would have astounded even the surrealist painters of the 1930s.

Pioneers of computer graphics for the media in this country are people like John Vince of Middlesex Polytechnic and John Lansdown of System Simulation who would take time off (Vince is an engineer, Lansdown an architect) to program sequences for TV commercials. These were usually line drawings produced on paper or animation cells by a pen plotter, and used as a guide, rather than final artwork, for a human animator who would trace, colour in and combine them with live action film manually. Another founding father of computer animation is Alan Kitching with his software package Antics.

Vince developed his own software called Picaso, which is a rather tortuous acronym that stands for picture computer algorithms subroutine oriented. This is now available commercially and is used by some of the specialist computer graphics facilities houses that have sprung up over the past few years. Lansdown generated the computer graphics sequences in the film Alien and helped Robinson Lambie-Nairn with the first and still exemplory Channel 4 logo, which was colour rendered by Triple I in Hollywood, a firm which recently went bust when the Disney film *Tron* flopped.

For fully shaded colour graphics, however, workers had to wait for a box of tricks called a framestore (sometimes called the frame buffer). But first here's a diversion into display technology.

The earliest graphics device to be attached to computers was the pen plotter. It wasn't until 1950 that the Whirlwind computer at MIT was connected to a CRT (cathode ray tube) to produce a graphical display – for air traffic control applications. In the early 1960s, a collaboration between General Motors and IBM led to the first commercial graphics display. This was a vector refresh (or calligraphic) device – the

electron gun in the CRT moved the beam around the screen under program control, building up the picture line by line.

These were very expensive and prone to flicker when displaying complex pictures containing many vectors. The computer stored the picture as a display list of co-ordinates and formulae to generate arcs, circles and so on. The processor had to cycle through this list at least 30 times a second to avoid flicker.

In 1968 a firm called Tektronix invented the direct view storage tube display, which was a good deal cheaper than the vector refresh model. Their 4014 was an instant success and became almost synonymous with CAD (computer-aided design). The picture was drawn on the screen in the same way, but a low-voltage flood beam kept it there – it didn't need refreshing constantly. There was no flicker, but it was less interactive – make a change to the drawing and ask the display to repaint and you may as well go off for a coffee break.

When Tektronix were developing the storage tube, they found that the only phosphor that would do the job was a green one. Since then green has become the colour of high technology, and for a while the glowing green grid was in danger of becoming the first computer graphics cliche.

Full colour displays became available when cheap memory chips made a commercial raster affordable. The first was produced by Ramtek in 1971. Nowadays the raster (from the Latin word rastrum which means rake) display rules. A raster display scans the screen top to bottom like a TV set does. Divide each scan line up into little squares and these are called pixels (short for picture element). The resolution of the screen is the number of pixels the computer can address horizontally by the number of lines vertically. The best resolution you can buy is 2048 x 1568 for a mono screen (made by UK vendor Westward) around 1500 x 1000 for colour. Interestingly enough, many mono screens – which could be any colour under the sun – still emulate the Tektronix and draw in green.

MEMORY

A raster display stores the state of each pixel in a bit map, and this is rather expensive on computer memory. For colour displays, the frame buffer (to get back to the original subject) must contain several bit planes. An eight plane system would give two to the power eight equals 256 possible colours; a 24 plane system has an astounding 16.8 million, which is considered to be enough for a realistic rendering.

There is however usually a trade off between the resolution and the number of bit planes available – you can have, say, a resolution of 1447 x 1024 and eight bit planes or 724 x 512 and 24 bit planes. This relatively low resolution, even on the most expensive display systems (the equivalent resolution of a storage tube display is 4000 x 4000), produces staircases or 'jaggies' on diagonal lines. But these can be overcome at the expense of some softening of the image by an optical illusion called anti-aliasing. This colours the pixels near a line or sharp edge with subtle shades of the foreground and background colours. The technique is most often used on print-like

'The Dire Straits video incorporates live action, enhanced pictures, 3D animation and digital effects'.

Channel 4 logo

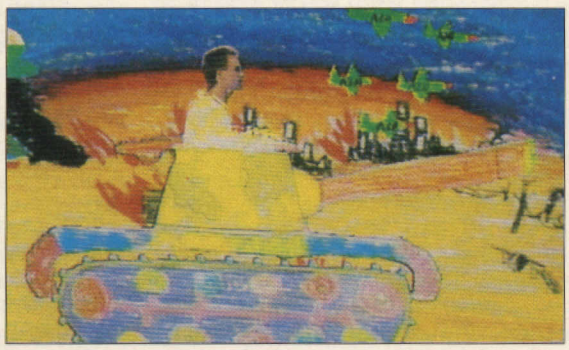
The most famous example of computer graphics on television is the Channel 4 ident. It is also a stunning example of the correct use of computer graphics. Computers wil never be able to reproduce the quirkiness of Mickey Mouse or the characters in the Kia-Ora commercial, nor should they be expected to. But when it comes to cool mathematical precision, computer graphics cannot be matched.

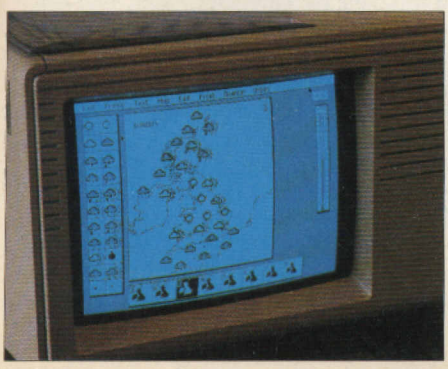
Channel 4 doesn't make its own programmes, but brings them togther from disparate sources. Martin Lambie-Nairn designed the logo as a sort of patchwork quilt to demonstrate that concept. He also wanted to produce a 3D sequence with the theme of 'coming together'. Up until then, all corporate TV idents had used flat 2D lettering.

So he approached System Simulation with a set of wooden blocks and Tony Pritchett animated the first 'round and back' sequence on a vector system. The idea was to plot out the frames onto paper and colour them by hand. But the result was not totally convincing. It had to look real enough to touch.

The only solution was to use computer graphics. At that time (the job was finished in October 1982, a month before Channel 4 went on the air), there was no one in the UK that could tackle such a job. So they went to Hollywood – to Triple I – for the first three idents (the idea of having more than one ident for a TV company was a new one too). The next three – the ones with tiny blocks and slats – were done in New York at Digital Effects.

Lambie-Nairn also designed the Channel 5/Hamlet spoof. This was hand animated to achieve the characterisation, and computer rendered in the UK by CAL Videographics.





Opposite page: 'Smarties' commercial and 'Weekend World' intro sequence, designed and produced by Robinson Lambie-Nairn Ltd. This page (above) Channel 4 logo designed and produced by Robinson Lambie-Nairn Ltd. Top far-left: BBC globe (Copyright BBC). Bottom far left: the weather map produced on a Macintosh XL, and bottom near left: as it appears on screen. Top near-left: the Sting video, by The Moving Picture Company.

lettering and on some systems it can be switched on and off when needed.

One of the first TV commercials to use full colour computer graphics was for Michelin MX tyres. This was produced for Lodge Cheesman by a company called Digital Pictures, founded by two ex-Slade School of Art researchers, Paul Brown and Chris Briscoe. They started off by renting time on a Data General Nova at the Slade's Experimental Department (now closed down) until they could afford their own Eclipse. They now have three Eclipses (with a £250,000 MV 10,000 supermini on order), three workstations, a digitiser, stop-frame video and film recorder – all paid for from profits!

In media land, a lot of subcontracting goes on and there is usually a lot of bickering about who gets credit for what. To demonstrate the chain of events and heirarchy of involvement, for the Smarties commercial currently showing on TV, the client Rowntree Macintosh approached their advertising agency J Walter Thompson, who went to design consultant Robinson Lambie-Nairn, who got the work done at Electronic Arts.

In the end though, most of the computer graphics seen on your TV screen have been produced at just a handful of companies or 'facilities houses' specialising in the technology. These include Digital Pictures, Electronic Arts (which also started life in a college – Imperial College of Technology), CAL Videographics, Electric Image and The Moving Picture Company.

The software for computer graphics is still a bit of a black art. There is not much of it around commercially and off-the-shelf packages are often decompiled and tweaked by the companies in a bid to keep ahead of the competition. Digital Pictures writes all its own – it's been 12 years in development and is (almost) equal to that of the American practitioners Robert Abel and Cranston-Csuri. Current software can handle cast shadows, transparency and local lighting. Texture mapping, ray tracing and fractals (more of which later) are on the way. CAL uses software based on Picaso running on a VAX supermini. Electric Image has recently bought Robert Abel's software and also runs it on a VAX. Electronic Arts uses an adapted version of another US-developed package, Movie-BYU from Brigham Young University, Utah.

MANIPULATING IMAGES

Recently the post-production houses have been getting into the act. When Channel 4 first started, it created a demand for firms providing studio space and production facilities. Companies like Molinaire seized the opportunity to prosper and invested in the latest equipment. Gradually kit from Chyron, Dubner and Ampex used first for generating captions and editing videotape has been getting more intelligent and able to manipulate 3D images on the screen.

One of the world leaders in this market is

'For a complex scene, it can take as long as 30 minutes to produce one frame lasting 1/25th of a second'

Newbury-based Quantel. Quantel, which is an abbreviation of quantised television, was founded in 1973 to bring image processing technology to broadcast engineering. Its first product was the DFS 3000, based on a framestore developed by sister company Micro Consultants to clean up radar signals. The unit was used for the 1976 Montreal Olympics and viewers could see, for the first time, quarter-sized pictures inserted into the corner of the TV screen.

This led on to the DPE 5000, the first production digital effects machine, still used all over the world. When you see tiny live TV pictures zooming, tumbling, spinning, oozing from shape to shape, and with comet tails, frozen trails and with the visual version of audio howl – that's usually the 5000 in action.

The 'ultimate illusion' machine is Quantel's Mirage. It can be used in realtime and in post production to achieve effects that pioneers like Lansdown, Kitching and Vince laboured over, even with computer aids, for days and nights. It can map live TV pictures onto spheres and cylinders, even have one picture inside the cylinder and another outside. It produces page turns from one live picture to the next and all kinds of other effects in 3D space.

Quantel is also responsible for the Paintbox. This is a machine for creating, colouring and manipulating 2D pictures. Using a pressure-sensitive stylus on an electronically sensitive tablet, designers can simulate drawings or paintings in watercolour, chalk, even airbrush. The harder the stylus is pressed, the more 'paint' is applied. There are 400,000 colours available from palettes at the bottom of the screen, or you can mix your own. The system is a retoucher's dream – a colour can be picked from anywhere on the screen image and used with the range of brushes to blank out or add to the picture. There are lots of graphic design functions such as cut-and-paste, step-and-repeat, stencil and text manipulation available as well.

Best of all, an existing photograph, drawing or TV frame can be 'grabbed' and altered by the system. The Paintbox has been used effectively and imaginatively on many commercials and promos – the *Financial Times* ad in which everything is black and white except the pink newspaper was done on the Paintbox; so was the latest Sting video.

MIXED EFFECTS

Most facilities houses use a mixture of equipment and techniques to produce a given result. The Dire Straits video promoting 'Money for Nothing' for example, incorporates live action, Paintbox-enhanced pictures, digital effects from an Ampex ADO and 3D animation produced on the Bosch FGS 4000. The band was filmed live in Budapest by Limelight Films and this was handed over to post production house Rushes. Director Steve Barron, who made 'Billy Jean' for Michael Jackson, had used Rushes' Paintbox to recolour and touch-up an ad for the Motorcycle Association. Employing the same technique as was used on the *Financial Times* ad, he grabed 100 frames of live action at a time, with just a hint of colour, called them up frame by frame, recoloured by hand, and dumped the frames back to disk.

Encouraged by the experience, he moved on to Bosch 3D for the Dire Straits

video. Bosch makes TV cameras and video recorders as well as washing machines and developed the FGS to spearhead its intrusion into the video effects market created by Quantel. The Bosch, at £275,000, is at the top end of the business and can be used to build, colour, light and animate 3D objects and background almost in real time. There are only three in this country – the other two are at CAL and The Moving Picture Company.

There are three ways of making an object on the Bosch: by designing a letter form and extruding it; by describing a profile and rotating it through 360 degrees; or by building a model, facet by facet, by describing its point of origin and x, y, z co-ordinates. It has limits and there are trade offs to be made. Nick Thompson at Rushes compares the constraints with fuel in a video game. Complex shapes use up fuel quickly, so does surface texture and shading.

So having built the models and the background in full glorious colour, you go back to wireframe drawings and simplified cubist backgrounds for the actual animation, directing the lighting, movement of the characters and camera angles in weird and wonderful ways.

The two aspects are combined in an overnight operation onto one inch tape. It can take as long as 30 minutes to produce one frame lasting 1/25th of a second for complex scenes.

LIVE ACTION

The Dire Straits video has two characters Sal and Harv moving around the post modernist sets. They were designed by illustrator Mickey Finn with the constraints of the system in mind – they are very boxy in appearance, with few facets and no curved surfaces. In the scene where Sal stands in front of banks of TVs, Rushes used the Bosch to make a white out of black matte (a background) with holes where the pictures on the TVs should appear. Live action was put through an Ampex ADO to produce a perspective view and a Quantel DPE trail function used to repeat the image so it fitted neatly into all the screens. This procedure had to be followed frame by frame 150 times, to produce just six seconds of tape.

While the record companies and commercial TV channels push work out to the facilities houses, the BBC runs its own Computer Graphics Workshop at Wood Lane, Shepherds Bush. In 1980 when Bill Gardner moved to the BBC from the Abacus computer-aided architectural design unit at Strathclyde University, he found that he'd inherited an obsolete Icon system developed for the 1979 general election. Now he has two Vax superminis and four Paintboxes. Their biggest project recently was the new-look weather system.

Satellite images and forecast data are sent to TV Centre over British Telecom Kilostream lines from the Met Office Cyber computer at Bracknell. These are interpreted by the weatherperson who builds up the maps on an Apple Macintosh XL (formerly called Lisa), picking and placing weather symbols onto a map background using a mouse. This is then sent off to the Vax which instructs the Paintbox to compile a full-colour image with anti-aliased text. A 'filmstrip' of 64 frames can be saved, mixing and animating pressure, rainfall, humidity and wind charts with satellite sequences.

When it comes to broadcast time, the weatherperson stands in front of a blue screen onto which is projected a faint image of the weather map. The sequence is stepped through by pressing a switch held in the right hand out of shot. Using colour separation overlay, the real person and the Paintbox chart are combined to produce the broadcast image. No moving about, no sticky symbols to fall off the map.

Another understated but innovative project was to design a free-running ident – one with no start and no finish – to replace the old motor-driven globe. The computer generated globe designed by Oliver Elmes used a 20,000 point database from Glasgow University to produce two sets of 600 mattes – one for the foreground continents, the other for the backgrounds. The gold shaded foreground was grabbed from a real shiny globe and coloured using a Paintbox. The animation is claimed to be the smoothest ever produced – 600 frames are used to create one 12 second revolution – and the edges of the continents are anti-aliased too.

'Quantel's Mirage can map live pictures onto spheres or cylinders, even with one picture inside a cylinder and the other outside'

The ident has now been stored on 4.5 Mbytes of microchip memory put into black boxes and dispatched to 14 regions. Why not video tape? There are no moving parts to go wrong, no tape to deteriorate in use and you don't tie up a £90,000 video machine – you get an instant pristine signal everytime.

The Workshop is also using a commercial solid modelling package called Medusa to develop completely synthetic sets, saving lots of cash on storage and fabrication of real ones. They have already used Medusa to help set up model shots on the sci-fi series 'Tripods' – where you will have a model in one studio, the actors in another and the backgrounds somewhere else. Instead of someone in the studio gallery saying 'up a bit, down a bit', the computer visualisation can be sent down to the camera operator's viewfinder, cutting, they say, set-up time by a quarter.

Synthetic sets, modelled by Medusa and 'made dirty' using Paintbox, will produce a rich image to test the imagination of any set designer. So what else is in store for the computer graphics buff?

Every year at a US conference called Siggraph, the experts come up with showreels to make the other experts gasp with admiration and envy. Current buzzwords are fractals and ray tracing. Fractal and 'particle' software aims to simulate randomly complex natural-looking phenomena such as clouds and mountains economically. A mountain range starts off as a mesh of polygons which is subdivided recursively so that there is self-similarity between the detail and the whole.

PHOTOREAL

Ray tracing is not a cousin of Max Headroom, it's a technique that follows imaginary rays of light from the screen back to the various objects they have been reflected off or transmitted through on their way from the light sources, local or ambient. It produces very realistic results, modelling mirrors, reflections, refractions, glossy and matt surfaces – and shadows are dealt with automatically. But to achieve photorealism, synthetic cameras with depth of field have to be developed too – that put the foreground in sharp focus and leave the background blurred.

As the software improves so does the hardware. Systems are now on the market with graphics engines that relieve the host computer and perform 3D transforms – pan, zoom, rotate – and colour shading at the display. And systems get cheaper. There is a 3D animation package for the IBM PC called Picture Maker. It was developed by solid modelling vendor Cubicomp and is distributed in the UK by Bournemouth-based Techex. A system which handles broadcast video input and output, multiple light sources, shading, anti-aliasing and has a paintbox package costs £30,000.

Finally, the most celebrated and mouthy piece of computer graphics is (almost) nothing of the sort. Max Headroom, the world's first computer-generated TV presenter, designed by Annabel Jankel and Rocky Morton of Cucumber Studios, is – you might have guessed – a cheat!

Although based on a 'presenter' called User Friendly from a New York Institute of Technology film 'The Works', who really is a 3D geometric model existing only as a computer data structure, Max Headroom is actor Matt Frewer wearing a rubber bathing cap and plastic suit. His colours have been enhanced, frame by frame, using a Paintbox and his actions (and voice) robotised using digital editing techniques. His irritatingly stylish quips, however, could only have been written by a computer.

EDUCATING APRICO

Apricot's F1e is a brilliant machine that thinks it's dumb, according to Mike James. Here he explains how it can be educated to use its full potential.

The F1e is one of the best and most frustrating machines I have yet encountered. It is the lowest cost route to true 16-bit computing (the F1e can be bought for around £500); it is a neat compact unit that, unlike the IBM PC, includes most of the features that you really need – hi res graphics, parallel printer port, serial port, battery backed date and time clock, 256K of RAM and a single 350K 3½" disk. It is even well built when you take its price into account. So what can be wrong with such a wonderful machine? Finding out how to use it! A computer without a suitable manual is about as useful as an abacus without beads. What is even worse is that the F1e is aimed at first time users and in particular the educational market where a machine that is difficult or frustrating to use is likely to put people off computing for ever.

Not all of the problem lies in the inadequate manual. The operating software supplied with the F1e – 'Activity' – is really not suitable for a machine with only 350K of disk storage. It was intended for the full F1 with 780K. All of this is avoidable by following a few simple guidelines and with a slight rearrangement of the software on the system disk. The point is that Apricot has supplied nearly all the software that you need to use the F1e as a powerful MS DOS computer – they just don't go out of their way to tell you about it!

Unpacking and getting an F1e set up is simplicity itself – as far as the plugs and sockets go. When you switch on, the screen displays a disk symbol, and the disk's capacity, a RAM chip symbol and the amount of RAM installed, and a flashing hand and key symbol. This is intended to encourage you to press the TIME/DATE key so that the internal clock/calendar can be updated from the battery backed clock and calendar in the keyboard.

Most first time users are very impressed by this display but find it utterly incomprehensible. To understand its meaning you have to know rather more about the way the F1e works than beginners normally do. The symbols are impressive but a single sentence, 'Press the TIME/DATE key now', would help no end.

MYSTERIOUS

If you do press the TIME/DATE key, or wait for 10 seconds, then the F1e starts to look for a system disk in drive A. This is fine as long as you know that this is what is required and don't make the mistake of loading a non-system disk into the drive. If you do load a non-system (or non-bootable) disk into the drive you are greeted by the addition of a large X on the screen and the number 99 alongside it. This must rank as one of the most mysterious error messages in all of computing and nowhere is there any mention of it in the user manuals.

If you ever get beyond this point and graduate to the technical reference manual you will find that error code 99 means 'non-system disk' and the large X on the right of the screen is generally used to indicate that something is wrong! Once again one line of text would be worth a thousand icons.

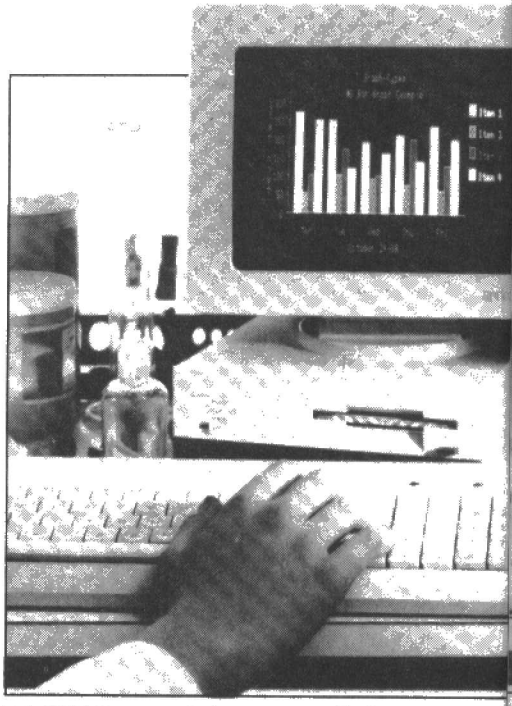
Of the four system disks supplied with the F1e, Disk One is the logical and correct choice for the first disk to insert into the drive and it does indeed boot the system. If this is the first time that the machine has booted up since it was unpacked you are rewarded with some high quality but slow graphics depicting a lorry moving across the screen and occasionally dropping icons into the (soon to be familiar) menu of the 'Activity' program. Most users are initially captivated by the display but they soon realise that rather than captivated they are captured!

This introduction to the F1e cannot be bypassed and you have to work through an introductory tutorial on how to use the numeric keypad to select options within the 'Activity' program.

Back in the early days of personal computing I jokingly suggested that before a new user was allowed to use a machine the machine should insist on administering a test to check that the user was up to the required standard of competence and was fit to be let loose on its software. Perhaps someone didn't see the funny side: the F1e's 'Activity' tutorial is compulsory – even if you have no intention of using it.

Many people give up on the tutorial part way through (it's paced to suit the slowest student) and try to reboot the system in an attempt to avoid the remainder – not a hope! Until you have completed the entire tutorial once all you get is lorries!

One new F1e user phoned me up, almost at the point of nervous collapse, to say that even though he'd completed the



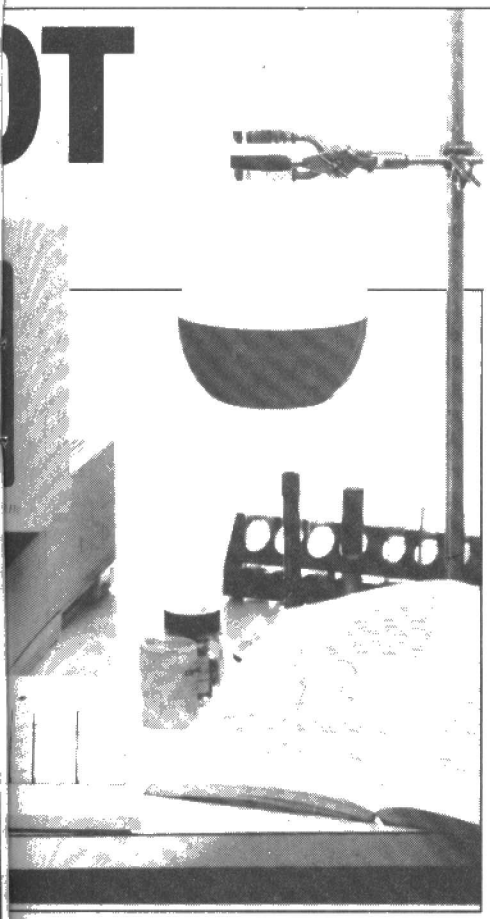
'X99 must be one of the most mysterious error messages in all of computing and nowhere is there a mention of it in the user manuals'

tutorial he still had to go through the whole palaver each time the machine was booted up and one more time would be all it would take to make him throw the machine out of the window! (The solution seemed to be to remove the write protection off the system disk.)

ACTIVITY

After getting through the lorry blockade you are in a specially written 'front end' to MS DOS that presents the user with a, currently fashionable, icon-based environment. You can select any program or system utility and run it simply by moving the cursor over to the appropriate icon and pressing the enter key.

This is fine as far as it goes and on the F1 it is a useful alternative to learning (or teaching) MS DOS commands but on the F1e it is less than satisfactory. The trouble is that 'Activity' depends on loading one of a number of 'overlays' from the disk to carry out whatever task you have selected and the F1e hasn't enough disk capacity to hold all of these on one disk. If you select a task, such as formatting a disk, and the appropriate overlay isn't on the disk then,



not unreasonably, you get an error message: 'Overlay missing'. Of course if you don't know what an overlay is and have no idea what to do if one is missing you might never get any further!

The correct procedure whenever you get an 'overlay missing' error message is to swop System Disk One for System Disk Two (or vice versa) and reselect the 'Activity' icon. On the F1 the 'overlay missing' error message never appears because all of the 'Activity' files on the F1e's pair of single sided disks are stored on one double sided F1 disk. All this is made worse by the fact that the F1e's manual makes no mention of this problem.

Even when you know all about missing overlays and have mastered the use of 'Activity', it is still irritating to have to keep on swopping disks in and out to achieve fairly simply objectives. It makes you think that the F1e is a very feeble machine when in fact quite the reverse is true. In my opinion the fault lies with the 'Activity' program not being matched to the characteristics of the F1e. If you abandon the 'Activity' program and work with MS DOS pure and simple then the F1e is remarkably easy to use.

PUTTING IT RIGHT

All you have to do is format a disk, using 'Activity', and copy the system files onto it, again using 'Activity'. Then copy, one by one, the files listed in Table One onto the disk. You will have to search through all four F1e system disks to find the required files and a single disk copy will take some time but once you have made the new system disk up you can use DISKCOPY to make further copies. There is a problem in using the MS DOS COPY command, and on some versions of the F1 and F1e it has to be used as:

COPY *file name*\ /S

and in others as

COPY *file name file name* /S

both of which are a little verbose when compared to

COPY *file name* /S

which works on most other versions of MS DOS. There also seems to be a bug in some versions of the COPY command that makes it unable to copy large files – in particular GWBASIC. If you find that the copy of GWBASIC on your new system disk is shorter than on 'Activity' Disk Two then use DISKCOPY to first copy all of 'Activity' Disk Two and then erase the unwanted files and copy the remainder in the usual way.

Once you have this new system disk the F1e behaves as described in the manual 'Apricot Microsoft Pack'. That is, it is a standard MS DOS machine and you can use it without having to swop disks all of the time. The Microsoft Pack manual tells you much more about the system than the rather slim 'Starter Pack Manual' and there are plenty of books on MS DOS to supplement it if need be.

Most first time users don't find MS DOS as difficult to use as the current producers of the icon based programs would have us believe. About the only aspect of MS DOS V2 that icon-based systems like GEM help to make simple is the hierarchical directory structure and with only 350K of disk storage you can avoid using this altogether. The only MS DOS commands that a beginner has to learn in order to use 90% of the machine's facilities are DIR, ERASE, DISKCOPY and a limited single drive version of the COPY command.

The only things you have to return to 'Activity' for are to format disks, copy the MS DOS system files, define new character fonts and new keyboard tables. Out of these the only two that the beginner has to know how to use are the format option and how to copy system files. If you are content to use DISKCOPY to transfer system files then formatting is the only reason for having to go back to 'Activity', and even this is avoidable (see later).

TRAP

There is one small trap to watch out for when you try to run GWBASIC or any other graphics program directly from MS DOS. Before 'Activity' is loaded the GSX graphics device driver is installed and any program that is run from 'Activity' can use GSX if it needs to. Now, GSX takes rather a lot of memory and even with 256K it is better not to install it unless a program actually uses it. The trouble is that GWBASIC and one or two others do use it and without it they crash.

This is no problem once you realise wha is missing, as GSX can be loaded manually by typing

GRAPHICS

as long as your system disk includes the files GRAPHICS, EXE F1.GSX and ASSIGN.SYS. You can automate this loading procedure and avoid trying to load GWBASIC without GSX installed by creating a batch file called BASIC.BAT containing

```
GRAPHICS
GWBASIC
```

GWBASIC can then be run simply by typing BASIC. The same trick will work with any other files that need GSX. To remove GSX and reclaim the memory that it occupies use

GRAPHICS NO

Used in this way GSX is another flexible asset that the F1e has at its disposal rather than a memory gobbling parasite.

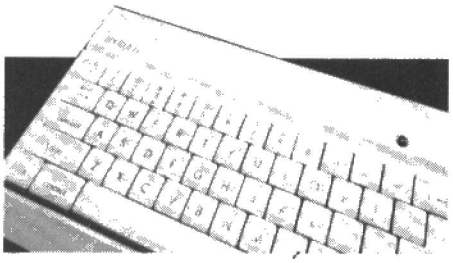
As well as 'Activity' you also get ACT Diary and ACT Sketch with the F1e. To be frank, in my opinion these two applications programs are no more than toys. Use them, have fun, and then go out and buy some real applications software. Although not perfect there is much to be said for the Superwriter, Supercalc, Superplanner applications pack. Its cheap and the three pieces of software are very usable. Superwriter is almost a standard on other MS DOS machines and its only shortcoming is that it is restricted to a 32K editing buffer. Large documents can be handled but only in 32K chunks. Supercalc I, II and III are the standard spread sheets on the IBM PC and many other MS DOS machines – highly recommended, and Superplanner is better than ACT Diary if you are going to use a computer for telephone numbers, addresses, appointments, etc.

For Supercalc the F1e's single sided disk isn't a problem. It only takes just over

'A full 760K of RAM gives you the choice of a good sized RAMdisk and plenty of room for more advanced software'

TABLE 1. MS DOS system disk

COMMAND	COM	PRINT	COM
DISKCOPY	COM	RECOVER	COM
MORE	COM	SORT	EXE
CHKDSK	COM	ASSIGN	SYS
EDLIN	COM	GRAPHICS	EXE
EXE2BIN	EXE	GWBASIC	EXE
FIND	EXE	F1	GSX



50K leaving around 300K for spreadsheet files (the largest spreadsheet that I use occupies around 10K but 5K is more typical). Superwriter is more of a problem but if you remove all the unnecessary files, including the dictionary, you are left with around 200K which is enough for many word processing applications. (The Superwriter file for this article took 20K to store.)

The overall message is that once you get rid of 'Activity' and all the system files that you don't need, the F1e's single drive is adequate for all but the most demanding applications, and even then a few small additions to the F1e would probably enable it to cope.

EXPANSION

If Apricot saw the F1e as an MS DOS machine there are two small pieces of software they would issue with it. The first is a format program which is available for all the members of the Apricot family. It will format single sided and double sided disks, a Winchester or a tape. It will also transfer the system files. In other words, it is a standard format utility of the sort that you will find on any other MS DOS machine. This program is available from Apricot so contact your dealer and free your F1e from 'Activity' forever.

The second piece of software is a RAMdisk device driver. A RAMdisk is just like a standard floppy disk except the files that you store on it are kept in memory. This means that a RAMdisk is very fast but all the files that are stored on it are lost when the machine is switched off.

If you read the F1e manual you will discover that Apricot say that a RAMdisk device driver is available for the F1 and F1e but it will only be useful when a RAM expansion card is fitted. This is quite true that if you have 'Activity' and GSX installed then there isn't enough memory left over to make a RAMdisk worthwhile. However if you are using only MS DOS then there is enough memory for a 64K RAMdisk and to run Superwriter. You might think that 64K is not a lot of storage space to have as drive B: but on a single disk system it makes life very pleasant.

The single disk COPY command can only be used to copy one file at a time and this means a lot of typing and a lot of disk swopping if you want to backup a number of files. With a RAMdisk all you have to do is copy all the files from drive A: to drive B: then change the disk in drive A: and copy them all back. Its fast and convenient and you will be surprised at the number of files you can store in 64K. Of course if you do invest in a memory expansion card then the size of the RAMdisk can be increased and you can copy all of your application files to drive B:.

The RAMdisk driver is available from Apricot for the F1e; in fact any RAMdisk driver that works on any other model in the range will work with the F1e, so once again contact your dealer.

If, like me, you start to like your new and powerful F1e then your mind might turn to the possibilities of expanding its hardware to make life even more convenient. The most obvious expansion option is to add a second disk drive. This is indeed possible. If you look inside the F1e you will find that provision has been made for powering a second drive and all you need to do is extend the ribbon cable.

However it is important to notice that the additional drive *must* be a Sony 3½" drive. The reason for this is that Sony drives spin at 600rpm while others spin at 300rpm. Apart from this the installation should be simple and the system software has been written to recognise automatically that there is a second drive and to install it as drive B:.

If you have any thoughts of adding a 5¼" drive then be warned this is more difficult than it looks. The main problem is that the F1e expects a data transfer rate of 500Kbs

'A format program is available from Apricot that can free your F1e from Activity forever'

and ordinary floppies have a transfer rate of 250Kbs. There are 5¼" floppies that work at 500Kbs (the Mitsubishi M4855 or M4854, for example) but they are not compatible with standard 5¼" drives. By an unlikely accident old fashioned 8" drives do work at 500Kbs and so if you have any old 8" drives around this might prove to be a cheap way of adding 1.6M of storage.

When it comes to increasing the amount of RAM that the F1e has, then, unless you have a very recent F1e, the simplest way is to buy an expansion card. Old, that is most, F1es are equipped with a PCB that makes no provision for changing the four banks of 64K chips with two banks of 256K chips. Newer F1es have all the necessary decoding on the board and changing from 256K RAM to 512K is just a matter of unsoldering 32 4116 dynamic RAMs, installing 16 256K chips and changing the position of two resistors. At current prices this modification would cost less than £100 and this is comparable to the cost of a 256K expansion card (if you shop around) so its not really worth the trouble of unsoldering, and so wasting, 32 64K chips. If you wait a little while the cost of a 512K expansion card should come down to less than £200 and this would expand the F1e to its full RAM capacity.

THE IDEAL F1e

After using the F1e as an MS DOS machine for quite a while I have a very clear idea of what I want to add to it. At first I thought that a second disk would be my first choice, either a 3½" or a 5¼" drive giving an extra 350K or 800K respectively. (I even toyed with the idea of adding an 8" drive.) Going even further in this direction I borrowed an MSD 10M byte Winchester but the problem of backing up 10M using 350K disks is not really practical, though the drive works very well otherwise.

After looking at the way I actually use the F1e I eventually, and rather reluctantly at first, came to the conclusion that the only reason I wanted a second drive was to free more space on the applications disk – that is to keep all Superwriter system files on drive A and all document files on drive B – and to make copying files easier. Both of these requirements are solved by using a 512K expansion card as a 512K RAMdisk!

As the F1e's disk drive only holds 350K it is easy to arrange for all the system files to be copied to drive B: using the AUTOEXEC facility in MS DOS and there will still be enough space left over to make a copy of all the files on another disk. At the moment the price of a 512K expansion card (£320) is just less than the cost of a 780K 3½" disk drive but with 256K RAM chips down to £4 each this will change soon. Having a full 760K of RAM in an F1e gives you the choice of a good sized RAMdisk and plenty of room to run more advanced, memory-hogging software such as GEM or Lotus 1-2-3.

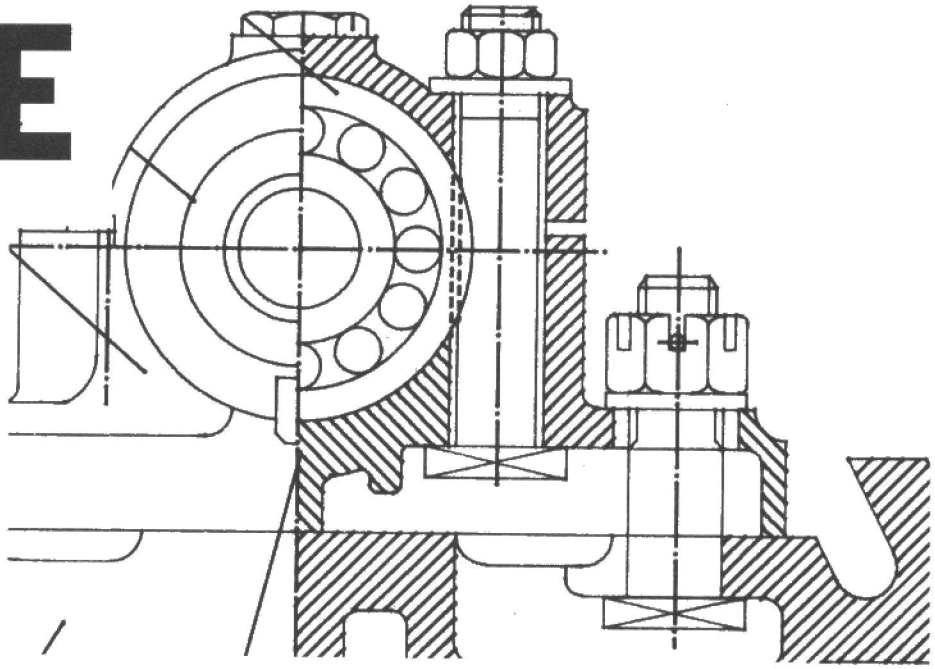
Apricot clearly sees the F1e as a low powered machine suitable for messing about and generally getting to know about computers before you decide to buy one of their more expensive machines.

The truth is that the F1e gives the impression of being a limited machine because of the mismatch between the software it is supplied with – 'Activity' – and its hardware. Once you get rid of 'Activity' the F1e running MS DOS is as good as, and in my opinion better than, machines that are more than twice the price – eg, the IBM PC!

Please Apricot – reconsider what software you bundle with the F1e and rewrite the manuals quickly before someone else produces a neat and powerful MS DOS machine for £500. Changing the F1e's image will not affect the sales of your other machines; you will sell more F1es and improve your customer relations no end.

For anyone about to buy an F1e, it is worth saying that there is a standard composite video output included which will drive almost any monochrome monitor that accepts composite video. This means you can save quite a bit of money by buying something other than Apricot's admittedly very pretty but rather expensive monitors. For example a 9" Apricot monitor costs £230 whereas a Phillips V7001 costs £72.45.

BITSTIK COMES OF AGE



Clive Williamson tries out Robocom's new improved Bitstik 2 draughting system for the BBC micro – and is thrilled to bits.

Bitstik 2 s the latest graphics development for the BBC micro from Robocom. The original Bitstik was designed as a computer draughting system for the Apple II and was subsequently released for the BBC B with 6502 Second Processor through Acorn. Now Robocom are marketing this second generation version themselves, either as a complete package, or as an upgrade for existing users of the first system.

When Bitstik first appeared, it was revolutionary in micro terms in that it was designed specifically to interface with high resolution plotters, and allowed technical drawings and artwork to be created and edited on the computer screen, then plotted out to a high degree of accuracy. Rather than limiting the Bitstik drawings to the relatively poor resolution of the host pc's screen display, Robocom chose to use the screen purely as a window onto what is effectively a much larger drawing area. Fine detail is added by 'zooming in' on successively smaller features of the overall work. On zooming out again, much of this detail is invisible on the micro's display, but it is still held securely in memory to be sent to the plotter when drawing the finished work. So the plotter's accuracy becomes the limiting factor in the system, rather than the screen graphics resolution of the micro.

To speed up the entry of lines, circles, arcs and other drawing data, Robocom use a specially designed joystick (which they call a 'Hand Controller') with movements in three axes instead of the usual two, and three buttons to perform selections from menus and actual drawing operations. It is virtually unnecessary to touch the micro's keyboard when working, except when entering text to label the drawings, and an experienced operator can get very fast indeed!

Two on-screen menus carry all the often-used drawing functions. These include lines and various arcs, circles, different sized nibs, choice of colour (which can determine pen width or colour at the plotting stage) and a screen-only fill routine. The latter uses a palette of 16 cross-hatch shades from the four basic colours available in Mode 1 on the BBC Micro. The menus also give access to zoom and pan functions, precision drawing aids like angle lock and grids, and to the Library functions needed to keep tabs on, and process, the images created.

Twin 5.25 inch floppy disks carry much of the system software (the rest is in a plug-in ROM for the BBC), and also store all the picture data. Specially formatted Library disks hold the pictures, and their contents can be inspected in miniature, as each disk has its own 'graphic index'.

A VISUAL WP

The real delight of this system is that it is rather like the visual equivalent of a word processor: images can be created, edited, added to, and even built up from a set of standard pre-drawn visual 'components'. One image can be used within another many times, but its data only has to be stored once. Hence if changes are made to the component, each occurence in the final image is updated automatically. Complete sets of often-used routines such as lettering or symbols can be drawn and saved individually to form a time-saving visual library.

The word processing analogy is further extended since there is no longer the need for complex re-drawing by hand after making minor changes on the screen. The whole thing is done automatically by the system software and the plotter, and there is the added bonus that basic work can be customised as often as necessary for new jobs or clients, saving an enormous amount of time and effort.

For all its innovation, the original Bitstik as transferred to the BBC micro for Acorn (now known as the Bitstik 1 'General Graphics System') was not without its problems. At first, Acorn's specification had no provision for plotter driver software, so the only way to use the resulting drawings was to photograph the screen images, or dump selected portions of the pictures onto a dot-matrix printer. The situation was eventually rectified by the launch of a set of plotter drivers, but this cost £75 + VAT.

On the draughting side, Bitstik 1 was a little short on curve routines, lacked the ability to locate points precisely, had no

Data

Bitstik 1	£795
Bitstik 2	£395
Bitstik 2 upgrade pack	£450
Bitstik 1 plotter software	£75
A0/A1 plotter software	£95
Hotline support service	£95
Penman GR1500 plotter	£249
Hitachi 672 plotter	£495

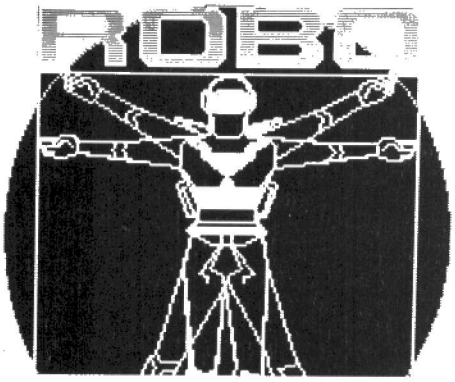
(All prices exclude VAT)

Equipment needed

BBC Micro Model B, Acorn 6502 Second Processor, Disk Interface and DNFS ROM, Dual 80 track 5.25 inch disk drive, TV Monitor (preferably colour).

Contact

Robocom, Clifton House, Clifton Terrace, London N4 3TB. Tel: 01 263 8585/272 8417.



facilities for in-built scaling, and no means of feeding in data from hard copy via a graphics or "bit-pad'. The new Bitstik 2 'Technical Draughting System' overcomes all but the last of these shortcomings, and the result is a highly usable package, aimed squarely at the professional market and the more demanding educational applications.

On top of the features found in the first Bitstik system, Bitstik 2 has a built-in set of plotter drivers covering 13 different A3 and A4 plotters (including Hewlett Packard, Watanabe, Gould and Penman machines), a number of minor improvements in menu selection and handling, and some major additions to the draughting commands and facilities. The most important extra is the provision for making drawings to scale and placing scaled text on them. The exact sizes of all the drawing details are held in memory, and these can be recalled automatically to add dimensions to the finished work. If a previously scaled image is taken from the system's Library, it can be copied true-to-scale into a new drawing.

BITSTIK TRANSFORMED

The scaling option alone is extremely powerful, and quite transforms the nature of the Bitstik package from an interesting educational or business accessory to a fully functional technical drawing system. Further, an adjustable curve is now added, which can be 'tuned' to the required shape; a new 'Find' command will instantly locate any point in the work (so that there are no unsightly holes in the finished picture); and an 'Undo' function can now be used to erase the last entry or zoom command. At the plotting stage, there is a 'Plot to scale' function, and the Hitachi 672 has been added to the range of A3 and A4 plotter drivers.

It's fair to say that the extras in Bitstik 2 don't come cheaply! Because of its greatly extended usefulness, Robocom have set the price of the complete system at £795 + VAT. This consists of the Hand Controller, two copies of the protected system software, Library and Work disks, and a Version 2 Graphics System ROM. There is also a ring-bound manual, which has been extensively re-written to include all the new functions. The upgrade for existing Bitstik 1 users on the Beeb costs £450 + VAT.

Penman plotter

The Penman plotter is a low-cost three pen unit, priced to appeal to those needing line output from devices such as the Bitstik on a budget. Penman can also be linked to other graphics software, and used to produce plots of Logo turtle graphics. It comes with a utility disk of software for the BBC micro, and can work with Acornsoft's version of the Logo language.

The unit itself is an amazing piece of British design by John Houldsworth. It consists of two sections, one housing the RS232 interface and circuitry, the other a free-ranging platform or 'robot'. The two parts are connected by a flexible umbilical cord, which sends power to the robot's two motors, and also carries feed-back information from the drive shafts as it moves about. When the Penman is placed at the corner of a sheet of drawing paper and switched on, it begins a self calibration routine, sensing two edges of the paper. From this it can calculate all the relative plotting points needed to produce a line drawing.

The robot plotter's drive mechanism uses only two moving parts – the motor shafts – which also act as wheels to provide the drive. The system software is self-calibrating to take the individual characteristics of each motor into account. The unit is styled to match the BBC micro, and has a separate power supply.

In practice the plots produced by Penman were a little variable. With careful setting up using the special black base-plate provided, simple plots were often handled well, but some inaccuracies began to creep in on more adventurous printouts. The Penman appears to have succeeded in its aim, providing a plotter-style output device at a reasonable price, and may prove a useful companion for some using the Bitstik 1 system, but it is not really precise enough to achieve truly professional results in keeping with the potential of Bitstik 2.

Hitachi 672 plotter

Robocom were so impressed when they saw the output from the Hitachi 672 XY plotter that they decided to sell it themselves as an option for the Bitstik system. Priced at £495 + VAT, the machine compares favourably with much more expensive flat-bed plotters, and offers A3 printing as well as the usual smaller A4 size.

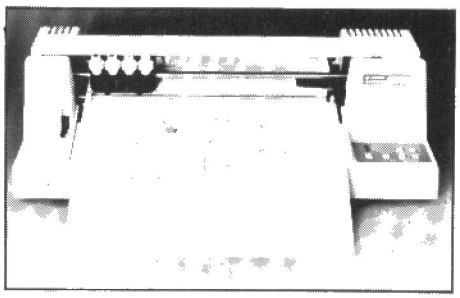
The unit is equipped with both RS232 serial and Centronics parallel outputs, and Robocom have chosen the latter for their installations.

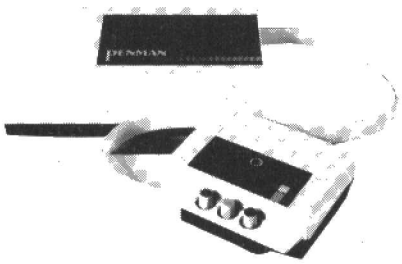
To keep the unit's foot-print size down, the transport is designed to move the pens in one direction, and the paper in the other, rather like the king-sized Hewlett Packards. The result is a very compact housing, being only 18.7 by 8.6 inches, and 5.3 inches high.

It uses four pens: the water-based fibre-tipped type are supplied as standard. For over-head work oil-based pens can be fitted, and with the right adaptors, the Pentel 0.3mm Ceramicron pens can be substituted for precision work.

The Hitachi proved quite fast in use, the supplied pen set producing good quality A3 work with even lines and reasonable small circles. For the money, it is an excellent output device for Bitstik 2, and should meet the needs of all but the most exacting artists and studios.

I have been thrilled by the results, and am now mulling over all sorts of possible uses for the system.





'Really professional large scale results can readily be obtained from the system'

In brief

- The original Bitstik 1 system is adequate for the preparation of forms and custom graphics and for CAD demonstrations and it costs half the price of the new version while allowing for the upgrade path, but those requiring a serious draughting tool should go for Bitstik 2 with its scaling routines and other refinements.
- Robocom is currently recommending the Hitachi 672 A3/A4 plotter to go with the system, and a complete package based on this versatile combination works out at just under £1500 – not including start-up costs for the BBC micro.
- Discounts are available on all the Robocom products for bona fide educational users.
- Potential uses of Bitstik 2 include printed circuit design, the preparation of assembly and manufacture diagrams, architectural plans, and multiple images for overhead projection.
- Graphic designers would probably get more use from the system if a graphics tablet input were available, as on the earlier Apple II version, but Robocom is apparently hard at work on that problem.

Reader Services

BBC EPROM BLOWER

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Complete kit £29.98 (including all components plus PCB but excluding software).
Suitable Power Supply Unit £11.64 (provides +5V, +6V, +12V).

60p handling charge must be added to all orders.

Send cheques/postal orders to
EPROM Blower Constructor's Pack, c/o Magenta Electronics,
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HOW TO ORDER

List the boards required and add 50p post and packing charge to the total cost of the boards. Send your order with a cheque or postal order to:

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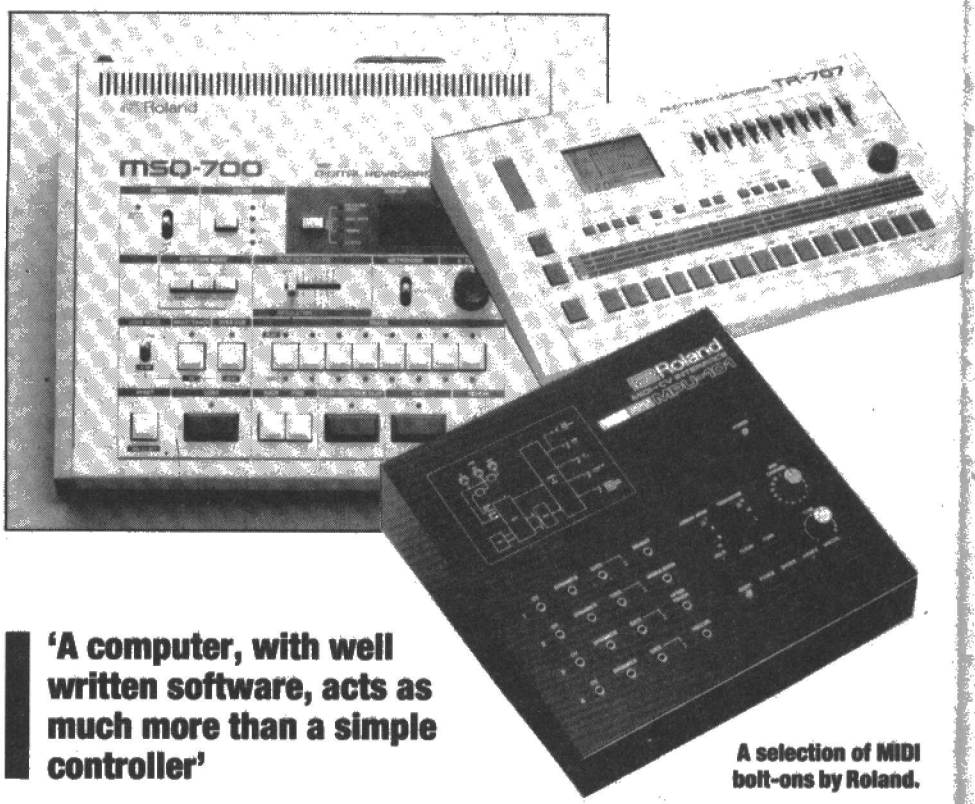
ELECTRO OUSTS ELGAR VIA MIDI

Would Mozart make better music with a MIDI interface on his harpsichord or is Sibelius spinning in his grave? Peter Luke describes the one standard with which all computer companies are in harmony.



A selection of MIDI bolt-ons by Roland.

Any self respecting computer will feature among its interfaces, at the very minimum, a Centronics parallel port and an RS232 serial connector. Increasingly though, in an effort to give their products even more market appeal, manufacturers of the latest micros are building in a bewildering array of I/O ports.

So enter the MIDI port: the initials stand for Musical Instrument Digital Interface. The MIDI standard defines the protocols by which micros can be linked to a variety of musical instruments.

The ability to generate sound effects and music is considered to be an important part of a machine's overall specification by most manufacturers; many micros build in some form of sound function but they range from the ability to produce feeble bleeps, to the respectable systems producing polyphonic sound.

Computers that offer a reasonable sound facility usually make use of a dedicated IC, most commonly the off-the-shelf AY 8910, though some companies have their own in-house sound ICs, most notably Commodore's SID chip. But these dedicated ICs can't hope to offer the quality of sound that can be obtained from a dedicated synthesiser. The output is often acceptable when played over a TV set's loudspeaker, but when played on a hi-fi system the shortcomings of the sound generators are all too often revealed.

The worst defect of a typical micro's sound section is distortion – sounds which should be pure sine waves are revealed to have distinctly rough edges when played back through a high quality power amplifier.

The specification of the MIDI interface was finalised in 1983, the year after a number of companies with a stake in the electronic music industry met to thrash out a standard format by which data could be exchanged between the instruments (in the main synthesisers and drum machines) produced by the various manufacturers within the group.

'A computer, with well written software, acts as much more than a simple controller'

For some time before this musicians had recognised that, by connecting electronic instruments together, they could produce a greatly extended range of sound. For example, a bass line and melody could be programmed into a sequencer, which was arranged so that it played the data back using the voice circuits of a keyboard while synchronising itself to a rhythm pattern set up on a drum machine.

The problem was that, in pre-MIDI days, there was no agreement on how different items of equipment would send and receive data. Most used a relationship of one volt per octave to determine the frequency of oscillators, but all sorts of trigger pulses were used to initiate the action of envelope generators. The MIDI agreement standardised the format in which data would be exchanged between all types of musical equipment.

As a brief aside, there are considerable parallels between the MIDI agreement and that reached by the members of the MSX working group. Indeed some companies, most notably Yamaha, were involved in the formation of both standards.

GOOD CONNECTIONS

The MIDI interface is most closely related to an RS232 serial port, in fact converting an RS232 port to a basic MIDI interface involves very few low-cost components, plus of course the appropriate software. But a MIDI interface is much faster than an RS232; it operates at around 31 Kbaud compared to the 9600 baud top speed of many RS232 drivers. The most common form of connector used to implement a MIDI port is a 180° five-pin DIN type, though the standard does not specify the physical connection and a variety of connectors are used including XLR types (usually found on instruments which are expected to stand up to the rigours of touring). Of the five pins of the DIN type connector only three are used: pin two is the screen connection and data is exchanged via pins four and five. To conform to the full

MIDI spec. equipment must provide three types of connector: MIDI in, MIDI out and MIDI thru.

Implementing a MIDI interface is – to the computer manufacturer – largely an exercise in software design. The commands supported by the system fall into two groups: channel commands and system commands. We'll first discuss the role of the channel commands. The majority of MIDI equipment can receive data on one of 16 channels. In this way it is possible to record (program) sequences on a specific channel, during play back only instruments assigned to that channel will respond to the pre-recorded sequence. The channel commands are thus associated with the transmission of note pitch and envelope data.

'Most micros suffer from sound distortion – good sound needs a synthesiser'

Next, the system commands, which are further broken down into four separate categories. System 'common' commands are recognised by all instruments in a system and are used to transmit information such as program selections. System 'real-time' commands are used to set up clock rates and to convey start/stop information throughout the system. System 'exclusive' commands are used for a particular manufacturer's products. The group of companies that set the MIDI standard recognised that, while MIDI is meant to be a standard, it would be unrealistic to ignore the fact that some manufacturers would at some stage want to build unique features into their equipment. In order to allow control of such functions via a MIDI interface the system exclusive command was built into the general specification. The final system command is the – self explanatory – system reset.

Under each of these command headings a number of different operations is possible. MIDI signals the exact function to be implemented by sending out a serial stream of status and data bytes which define the exact operation to be carried out. Status and data bytes are identified by a flag – a status byte starts with a binary 1 while a data byte begins with a 0. Data is sent in eight bit byte blocks, with one bit allocated to the status flag; this means that there are seven data bits available, enough to represent 127 unique codes. As an example the three byte note of channel code would be sent as:

1000xxxx 0xxxxxxx 0xxxxxxx

Bit seven of byte one is set to one to indicate a status byte, the next three bits (all 0) indicate a channel off command, the four least significant bits hold a binary number (0-16) to indicate which channel is to be turned off. The next byte starts with a 0 to show that data is to follow, the other seven bits indicate which of the 127 notes is to be turned off (this corresponds to a range of 10.5 octaves with middle C being note 60). The final byte is also data (bit one is 0), and the seven bit number this time corresponds to the key off velocity.

Each of the functions associated with MIDI are signalled in a similar fashion. For example a system exclusive command is signalled by the controller sending out a stream in the form:

1xxxxxxx 0xxxxxxx 11110111

The first bit of the first byte is 1 (signalling a control byte), the next seven bits identify a particular manufacturer (Yamaha is, for example, 0011011 – decimal 43). The second byte begins with a 0 to indicate that data is to follow. The last byte is an end of block terminator.

In the simplest of MIDI applications, the MIDI-out of a computer would be linked to the MIDI-in socket of a synthesiser. In this setup the program sequence would be played using the keyboard's voice section. Note though that in this basic setup it would not be possible to enter data via the synth's keyboard and store it in the computer. This would require a second connection to be made between the computer's MIDI-in connector and the keyboard's MIDI-out socket.

In more extensive applications, the basic set-up will be augmented by the addition of a rhythm unit. This allows a programmed sequence and rhythm track to be played back at a tempo set by one of the units, most commonly the rhythm generator.

FUTURE NOTES

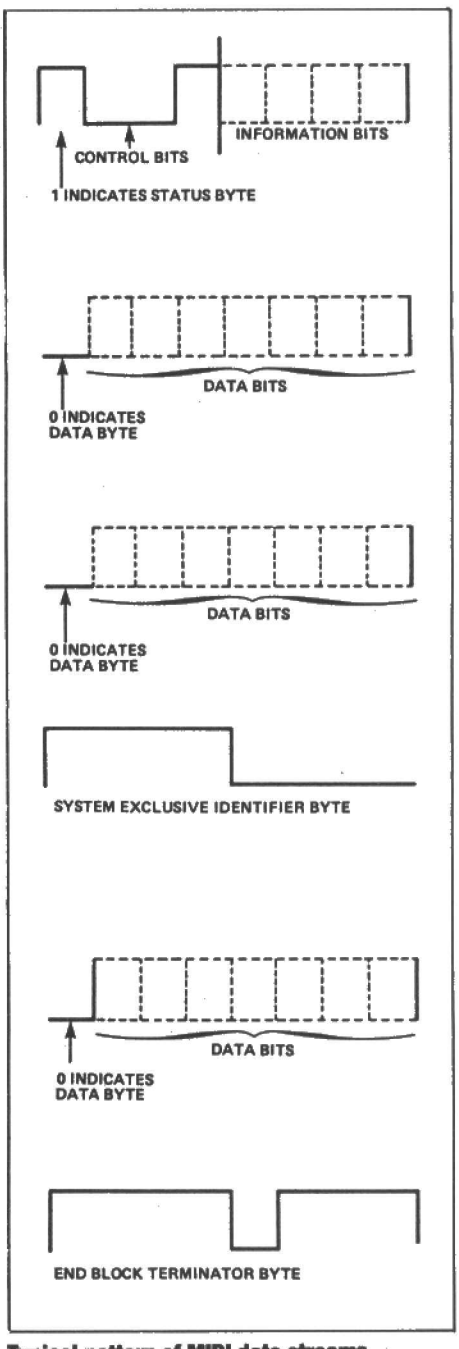
A computer, coupled with well written software, acts as far more than a simple controller. By making use of the graphics facilities of the computer it is possible to display the music being played either as a traditional score or as a series of parameters relating to various sections of the instrument.

There are a number of MIDI compatible software packages available for computers, including the CBM 64 and BBC micro. These machines, in common with the majority of micros, don't feature a MIDI interface and require hardware additions to implement the standard. The latest hardware, including the likes of the Atari 520ST and the Commodore Amiga, have a built-in MIDI capability. This fact coupled with the undoubted power of both machines should mean that some very flexible MIDI software will soon be available. *Computing Age* is looking forward to reviewing MIDI applications software in the near future.

Readers wishing to obtain the full technical spec. should contact Sequential Circuits Ltd, Post Bus 16, 3640 AA Mijdrecht, Holland. The company will supply the details for a small feee.

MIDI channel codes

Note on 1001[4 bit channel code]
+ key number data byte and key on velocity byte
Note off 1000[4 bit channel code]
+ key number data byte and key off (release) velocity byte.
Polyphonic key pressure 1010[4 bit channel codes]
+ key number data byte and pressure after touch value (omni mode)
Control change 1011[4 bit channel number]
+ control address and control channel.
Program change 1100[4 bit channel number]
+ program number
Channel pressure 1101[4 bit channel number]
+ touch after amount.
Undefined 1110[4 bit channel number]
+ varies according to particular manufacturers application.



Typical pattern of MIDI data streams.

SQUARE PEG IN ROUND HOLE

Why do Amstrad's CPC464 and the ill fated 664 have so little usable RAM under CP/M? Is 39.5K enough to run applications programs? Mike James finds that it is.

The launch of the Amstrad CPC6128 coincided with the death of the company's ill fated CPC664 model. Amstrad has also made it clear that the cassette based CPC464 is unlikely to be produced after the end of this year. This is not good news to owners of these computers who can expect a deterioration in the level of support offered to them, both by Amstrad and by third party software producers.

It is those who bought a CPC664 during its short life that have most to worry about. This computer was marketed as a machine that would appeal to the business user, a central plank of the campaign being that CP/M software was bundled with the system. The suggestion was that this would give users access to the vast range of applications software that will run under this operating system. A similar suggestion is made to 464 users who up-grade their systems with the DD1 disk drive plus interface.

The bad news for both these groups of users is that though both machines are well designed and have 64K of RAM, only 39.5K of this is available to applications running under CP/M. This is very little memory – especially when compared with the 52K available to CP/M on similar 64K machines.

But all is not lost: in spite of the shortage of RAM, Amstrad's CP/M is still usable.

MEMORY MAP

Why is only 39.5K of applications RAM available on the 464/664 machines? Compare the Amstrad's memory map in **Figure 1** to the typical allocation of RAM within a CP/M system in **Figure 2** (see box).

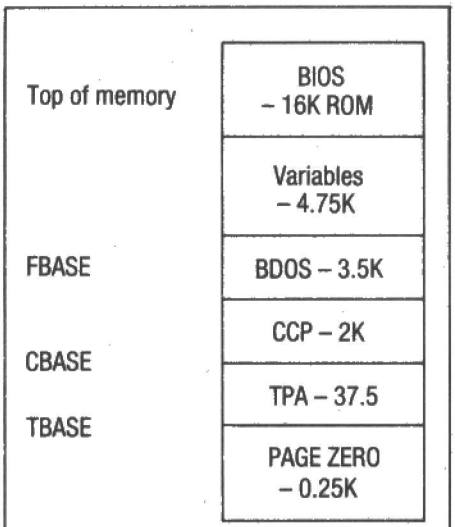


Figure 1. Memory map of the Amstrad 664. Note that the top 16K of RAM is used to provide the memory mapped hi-res screen. The RAM is overlaid by a ROM containing the BIOS and other ROM-based CP/M code.

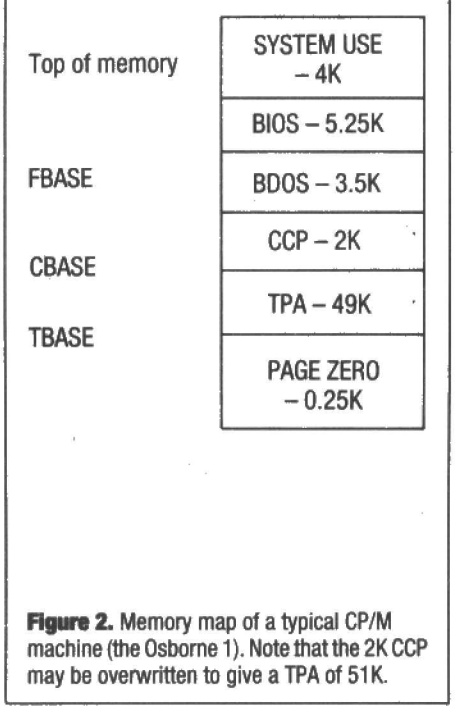


Figure 2. Memory map of a typical CP/M machine (the Osborne 1). Note that the 2K CCP may be overwritten to give a TPA of 51K.

In the Amstrad map, the 16K of ROM allocated to the BIOS (basic input-output system) isn't as excessive as it may seem as much of the ROM is actually used by AMSDOS (see later) and DR LOGO. It is likely that the Amstrad's BIOS is no bigger than an average BIOS of around 4K. The real shock contained in the memory map is

'It is encouraging to see software houses customising programs to run under Amstrad CP/M'

CP/M memory map

The simplest layout of CP/M in a machine's memory is shown in **Figure 2.** The CP/M operating system is composed of the BIOS (basic input output system), the BDOS (basic disk operating system), the CCP (console command processor) and the system variables stored in page zero. The area of memory available to applications programs is the TPA (transient program area), although it is possible for an applications program to use the CCP's memory by overwriting it.

The BDOS and the CCP are the same for all CP/M systems and so they should occupy a fixed amount of memory. The BDOS is responsible for implementing CP/M file organisation, creating files, deleting files etc. The CCP is responsible for receiving input typed at the keyboard, decyphering commands and calling on the BDOS to carry them out.

The BIOS is not really part of CP/M at all and is best thought of as *service* software in that it is usually written by the machine manufacturer. It interfaces CP/M to the hardware and contains routines to read and write disk sectors, read characters from the keyboard, print characters on the screen, etc. These routines are called from within the BDOS to enable the operating system to carry out its more sophisticated functions and are only made available to applications software via the BDOS.

It is in the BIOS where inefficient coding can waste valuable memory. As it is the responsibility of the manufacturer to write the BIOS its size depends on the hardware it is being written for and on the ability of the system programmers employed to do the job.

the 4.75K of RAM used for CP/M and other ROM firmware variables. It is true that an operating system such as CP/M cannot be completely ROM-based – it needs RAM buffers for all sorts of things – but 4.75K of RAM in addition to the BIOS code in ROM seems rather a large memory allocation.

The BDOS (basic disk operating system) and the CCP (console command processor) occupy the usual amount of room and this gives a TPA (transient program area) of 37.5K; overwriting the CCP gives a maximum workspace of 39.5K. There are a number of extra features in Amstrad CP/M but many would have traded these, AMSDOS and DR LOGO, for more CP/M – the BDOS – in ROM. In theory there is no reason why most of CP/M shouldn't reside in ROM with only 2K or 4K of RAM for buffers and workspace, giving a machine with a larger TPA.

POCKET WORDSTAR

All this talk about small TPAs may give the impression that Amstrad CP/M is something of a toy system, but in fact it is somewhat better than most CP/M systems. For example, the handling of disk errors has been improved to include a 'Retry, Ignore or Cancel' question before the infamous 'BDOS error on drive A:' message is produced.

There are many CP/M programs that will run with only 39.5K of memory but many others have been designed to take advantage of what had come to be thought of as a typical TPA – 48 to 56K. It is encouraging to find that software houses are beginning to customise well known programs to run under Amstrad CP/M.

'AMDOS on the 664 is a much more practical proposition than CP/M'

For example, the well known and sometimes loved Wordstar is now available as Pocket Wordstar from Cumana. Testing of an early pre-release version showed that it behaves like a full implementation of Wordstar even though it has been squeezed into 39.5K. Of course not even a Pocket Wordstar can be made to fit into 39.5K in its entirety and there are a number of overlay files that are read in from disk as they are required, but no more so than other versions of Wordstar.

Including Mailmerge, Pocket Wordstar leaves about 80K on a disk and this is enough for a good few letters and about five articles like this one, including their backup files. As long as Cumana follow through with good documentation and support, Pocket Wordstar raises the Amstrad to the level of a very credible wordprocessing machine.

AMSDOS

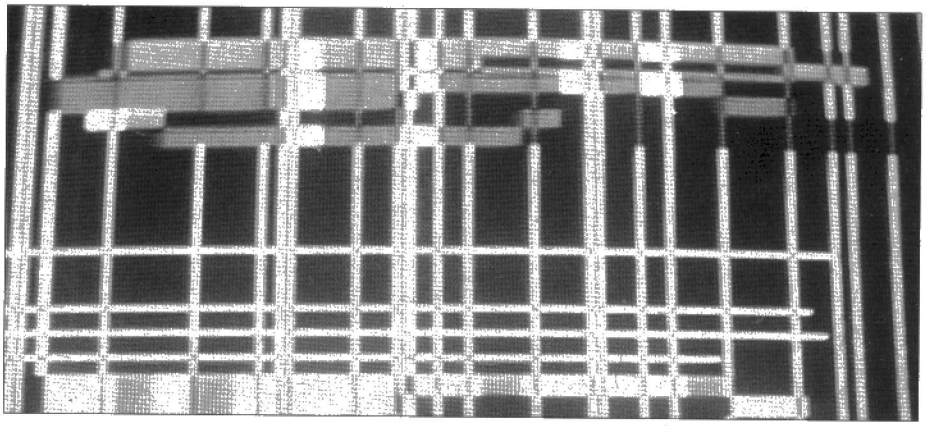
When the Amstrad 464 with disk interface or the 664 is first switched on, it starts running Basic under AMSDOS rather than CP/M. The Amstrad literature claims that AMSDOS is a complement rather than a rival to CP/M but it is difficult not to be aware of how much more practical a proposition AMSDOS is. AMSDOS uses the same file structure as CP/M and so it can read and write CP/M diskettes. Not only does AMSDOS work like CP/M, it even provides a set of very CP/M-like commands: REN for rename, ERA for erase – the only real difference at the command level is that AMSDOS uses CAT instead of DIR.

From the programmer's point of view AMSDOS only takes a few K more than the cassette operating system. Unlike CP/M, access to its disk operations, reading and writing a file etc, are via calls to individual machine code subroutines. As these are just disk versions of the familiar cassette handling subroutines, converting an existing program from tape to disk is almost a trivial matter. From the user's point of view this holds out the promise of familiar cassette software available in disk versions without too much delay.

Pocket Wordstar costs £119 (including VAT) and Cumana can be contacted on 0483 503121.

COMPUTER GENER

A synthetic collusion of random art (graphics without a package) involving Geoff Davis, Simon Holland and Bruno de Florence, assembled by Chris Bourne.



Art is a fragile word. Although most people know what they mean by it, few can produce definitions that satisfy even themselves. Those who do are, almost invariably, immediately scorned and rejected by fellow critics. So when a bunch of characters whom most of us might regard as terminal avant-gardists, or terminally nuts, or both, start talking about computer art, and produce simple Basic programs to write stories and draw pictures at random, with frequently weird results, the notoriously invisible 'man in the street' is apt to blow his central processor and dismiss the lot as time-wasting adolescent rubbish.

Micro-Arts is an organisation – for want of a better word – dedicated to exploring concepts of art on home computer systems such as the Spectrum or BBC. This article is constructed from the bones of a conversation involving three contributors to Micro-Arts.

Geoff Davis started Micro-Arts. He's a writer of fiction and has a particular interest in using micros to generate language. Simon Holland is an ex-art student currently working as a film editor for the BBC, and Bruno de Florence is a French filmmaker contributing to Micronet 800, where subscribers will shortly be able to find 200 pages of Micro-Arts articles, information and software.

Working on the principle that nothing happens unless you make it happen, we've also encouraged the micros to speak for themselves, so that parts of the article consist of synthesised portions of interviews and statements concerning computer art. If such a thing exists.

[IF YOU BELIEVE IN COMPUTER ART READ PARA ONE]
[IF YOU THINK IT'S ALL RUBBISH READ PARA TWO]

1 Oddly enough, Bruno is an unbeliever. He identifies an immediate problem in designing pictures on computers – the rotten resolution you get on all machines

'The computer industry is based on bland exploitation. That is "we sell you nothing", basically. I was discussing this with a cathode ray manufacturer. As far as the computer is concerned this technology is over. He disagreed, naturally,'

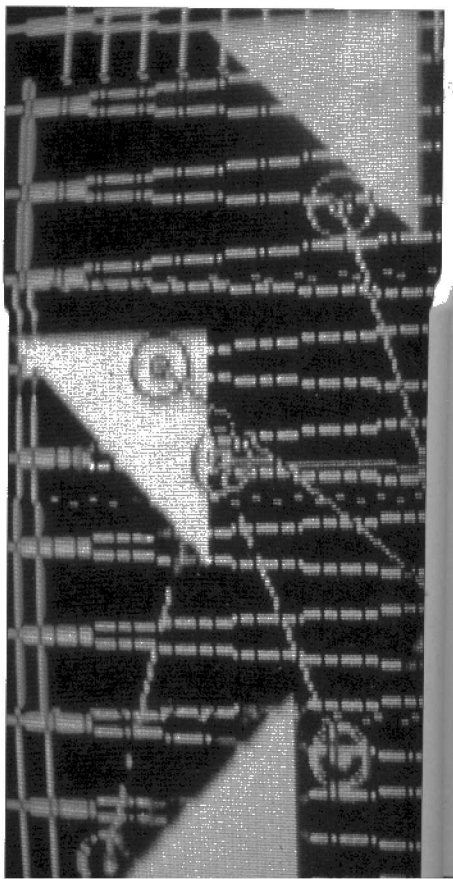
'You cannot get the high resolution architecture from the cathode ray tube – machine processing power is on a much higher level. Secondly, it's such a mess to go from one machine to another. We're so far from being able to use any machine. When I read comments from people in magazines it's like radio without wires, it's about soldering bits onto the corners.'
[WHY WE SHOULD WANT HIGH RESOLUTION ARCHITECTURE – PARA 1A]
[WHY WE SHOULD NOT PARA 1B]
[OTHERWISE PARA 3]

1A Bruno: 'Well, the Spectrum may have it's own charm but the more precision you have in your manipulation of co-ordinates the more precise is your manipulation of space. The hand brush has infinite precision. I really feel limited by the hires problem. It's very difficult to construct the algorithms for proper lighting and drawing.'
[GOTO PARA 1B OR 3]

1B Try writing a program to shift thick black bars around the screen at random. Then change the bars into lines. Which looks more satisfactory? Why? (Do it).
[GOTO PARA THREE]

2 Computer art separates into two particular areas. You can use the computer to draw pictures, and as such the machine is a tool, like brushes and canvas. A novel written on a word-processor might even be included in such a definition, particularly if the writer found the computer helpful in

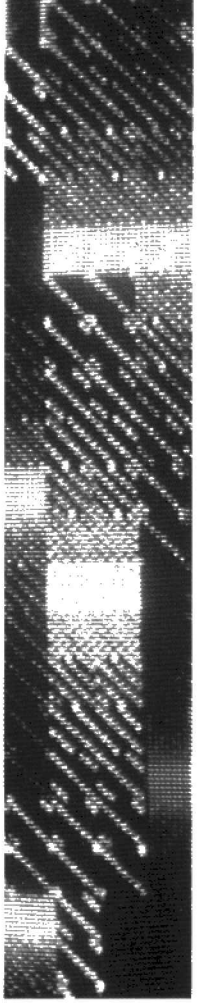
'Micro-Arts software is concerned with random, moving graphics – visual wallpaper'



A Manifesto

For most of this article we've let Micro-Arts speak for themselves – now it's our turn to ruminate. There are (at least) four ways of using computers as an artistic medium: photo-realistic 3D images of the kind seen on TV; static images produced by painting software which, as Geoff points out, dictate the style of the end product; random art generated by the computer within parameters laid out in a Basic program by the artist (the Micro-Arts method); and finally, the Soft Computing style of messing around until something turns up – without imposing any structure or form. The computer does the work, the artists negates responsibility – daft idea. Micro-Arts has produced some stunningly original work to accompany occasional lapses into sophistry. You will soon be able to find Micro-Arts on Micronet pages 8008.

ATED ART



"The use of randomness . . . is not an evasion of responsibility, it is not a lazy or escapist attitude. There is no doubt that the painter remains – as he has always been – the sovereign decider of what and how he will create. Randomness is only a tool or technique to help the artist in his investigations." Vera Molnar, The Role Randomness Can Play in Visual Art, 1981.

About Micro-Arts

Micro-Arts was formed by Geoff Davis in 1984, and was based around a magazine. 'It was very difficult to get started. No-one in the art world was interested in computers and in the computer world everyone said "We're not interested in art."' Only one issue was produced, but several cassettes of software have been released for the Spectrum and BBC.

'All arts magazines are funded by the Arts Council' says Jeff. 'I've always avoided that kind of thing. Micro-Arts used to support itself financially, but not recently: we've spent the last six months setting up 200 pages on Micronet.'

As a computer database, Micronet would seem an ideal home for a magazine on computer art. The pages contain articles by luminaries such as painter Harold Cohen, who uses turtle graphics to design large canvases, and musician Simon Emmerson. Micro-Arts' own software is featured, as well as general information about modern and avant-garde work. The software includes work such as *Abstract Originals*, a suite of six programs producing 'visual wallpaper', and *Various Unusual Events*. That wacky program includes *Carry on Computing* – the only way to stop the computer happily churning out numbers and fiddling with its program is to answer no, in direct language – to control the system you have to reject it. Another favourite is the Money-Work system, based on the *Scum Manifesto* by Valerie Solanas. 'There's a new version' says Jeff, 'without the bit about "Man is a walking dildo . . ." Now he has his trousers on. We've had to sign something saying we won't bring Micronet into disrepute.'

All the programs are written in Basic, which means they can be readily altered and adapted. 'Protected software is like having a car with the bonnet soldered down.' In fact, Bruno gets quite amused by the concept of copyright. He asks who has the rights to a meal cooked from a recipe book? Apparently this is a genuine legal problem.

The two cassettes will also be available soon in a double pack for £3.95 (Spectrum only). The case, true to form, has a glossy paper insert in mock snakeskin with no words on it at all. You can get more information about Micro-Arts from Geoff at PO BOX 587, London SW8 1XL – or through the Micronet mailbox system.

ways typewriters are not.

Then there's the other side, art generated by the computer itself, with random elements. That can be a very controlled operation. Vera Molnar's "Ten Points" series uses strict mathematical limits for the linking of points with lines, although the actual lines are all chosen at random. One of the attractions of randomness is that it may free the artist from all cultural influences – guaranteed originality.

[COMPUTER AT RANDOM – PARA 2A AND FORWARDS]

2A Much published Micro-Arts software is concerned with random, moving graphics. Visual wallpaper is what Geoff calls it. His text generator is a different kettle of . . . It's more spectacular output centres around a short story he wrote about a cow which forces a woman to boil her head in a bucket of water(!). Primed with vocabulary mixing religion, violence, and family relationships, the generator churns out endless stories of grotesque horror. 'It's the opposite of writers 'block' grins Geoff.

[GOTO PARA 3. IF YOU'RE FED UP WITH BRUNO, GO TO 3A]

3 Bruno regards randomly generated work as not being art at all, even if the results of such programs look like 'genuine' surrealist or abstract work. 'Could the surrealists in the 1930s have used a micro?' he asks. 'I'm not so sure – that work came out of research into the mind, into the unconscious. On a micro, can you get beyond the mechanical mind?'

[GOTO PARA 3A OR 3B]

3A Of course, there's nearly always a point where the artist has to make a selection – of finished versions of a piece, or of the parameters under which the program will operate. 'Therefore' says Bruno, triumphantly seizing on the core of the paradox, 'You cannot talk about computer art.'

[GOTO PARA 3B OR 4]

3B On the other hand, what if you simply present the work of the computer as a piece of art, and don't tell anybody how it was produced – whether it was randomly generated, or under the complete control of the artist?

'As long as it looks like any other sort of art it is validated' says Bruno.

[GOTO PARA 4]

4 Much computer art practised professionally is in the field of design – the much-applauded Channel 4 logo is a case in point. Geoff finds that atmosphere stifling. 'Everything has solid letters rotating to Jean Michel Jarre music. That's what they call art. I went round the colleges last year to see what they were doing with computers. They all came from 3D design studios and they were all doing block graphics. I haven't bothered this time.'

The main point, if you want to get into computer art, is not to get hung up on perfect reproductions of Marilyn Munroe and the like.

'Most people' says Geoff, 'say "isn't that a good one? It looks just like a photo." So what!'

[IF YOU'VE CHANGED YOUR MIND SINCE STARTING TO READ, GO BACK TO PARA ONE AND CATCH UP.]

Z80 synthesis

You don't have to limit yourself to graphics. Computers can generate text (with a little help). The following statements were issued by a 48K Spectrum after it was fed various statements made by contributors to Micro-Arts. Geoff's Text Generator is based on word banks which give a remarkably flexible structure to the text if you start with a large enough sample of words. But is it literature? Move over Karl Popper – we're on your tail . . .

We are not doing art . . . Any artist is a multi-purpose work and the problems are invented by the machine . . . The computer industry is bland . . . That is, you sell them ideas basically . . . As far as the synthesiser is used the product is artistic . . . You cannot have the one power . . . It's such a thing to go from one revolution to another . . . People always use exploitation but revolutions do architecture and are used as part of the product . . . What they can do on manipulation is because it's low resolution and has its own personal charm . . . It was thinking revolution with a graphics manufacturer . . . As far as sound values were concerned this level was precise . . . As far as the computer is concerned any manipulation is meaningless . . . The power is nothing . . . Pleasant results are all invented . . . The computer industry? It's such a mess.

Now is that nonsense or is it not?

Spy

Keeping a watch on the latest boxes of tricks to plug into your computer, plus all that's new in software.

SOFTWARE SELECTION

Excuse us if this month's software column turns into an endless list of **Atari** products: be patient.

Up to 100 software houses are said to have finished or be working on over 200 products for the ST range. Those that follow were seen up and running at the PCW show. From English Software comes two unremarkable games, **ST Hyperdrive** (ex QL) and **Chop Suey.** From Paradox there's one game and one business package (the paradox?). **Database/Desk Diary** took one programmer a mere two weeks to write, whilst **Mission Mouse** a game which uses the ST's hi-res mono mode graphics, was written in machine code on the QL and ported across in a similar time frame. It will come as no surprise therefore, that a number of QL software houses were seen lurking with Atari, including Talent, considering marketing a version of **Graphiq1** in competition with **GEM Paint,** together with a data management system, **Flexifile,** complete with report generator. Metacomco, rapidly becoming *the* 68000 software house showed a **68000 Assembler** and **Pascal** and Hisoft, a house in the same mould, are working on an Atari C package. GST will shortly release a **CP/M emulator** for those who prefer to walk rather than run (the 80+ BOS system and P system have already been ported to the Atari giving access to a mass of business packages) and just to ground the QL's nose into the dirt we saw a chess game by Intelligent Chess Software with graphics to rival those of Psion's QL Chess. No comment available yet on its games playing ability.

Best game on the stand was **Bratakkas** by Psychnosis, which made excellent use of the ST's graphics handling and showed top class animation, but BT's Firebird Software are said to have a version of **Elite** waiting in the wings, as well as the popular **Hitch Hiker's Guide to the Galaxy.** Microdeal outdid the 'not quite ready packages' by having **Lands of Havoc** on sale at the show.

Business software included the usual plethora of stock management systems, database systems, wordprocessors, accounts software etc. Most of which emanated from former Sharp specialists

Continued opposite

SPRITE BOARD

The Logotron Sprite board for the BBC micro uses Logo to control and animate sprites (turtles) and frees 20K of precious RAM.

The board 'allows even the computer novice to write arcade type programs' with 'easy access to true animation and in a fraction of the time taken when using tedious machine code' according to the makers.

The sprite chip controls up to 32 programmable hard sprites simultaneously, and provides 64 different sprite shapes. Facilities include collision detection, shape and speed changes, shade demand, filling and 'stamping'. Logotron hopes to see a lot of sales in the educational as well as recreational markets. *Contact 01 352 1088.*

OS9 FOR BBC/QL

Both BBC and QL users will be able to exploit Cumana's OS9/68000 Upgrade board. OS9 is a 68XX multitasking operating system already available for the Dragon 64. It features UNIX software compatibility a C source code level, a hardware independent I/O, hierarchical disk directory, hardware independent video display, and a graphics kernal with multiple fonts.

The BBC board, which fits inside the casing, has an 8MHz 68008 processor, 512K RAM expansion, DD disk controller, real-time clock and battery backup, and Winchester interface. The QL board also includes up to 144K ROM expansion, parallel and serial ports. It is connected to the 64-pin edge connector. *Contact Cumana 0483 503121.*

AMSTRAD TELETEXT

The Amstrad range of computers are all compatible with the Teletext and Telesoftware adaptor recently announced by Volex Electronics. The information provided via the medium of Teletext is, unlike that obtained via Viewdata systems, free. No 'phone line charges or on-line costs.

The Volex adaptor allows users to select pages which may then be saved, printed and viewed either under program control or via push buttons on the unit. The unit also lets users download and run telesoftware programs. The Volex adaptor consists of two modules, the interface to the computer and a tuner module.

More info on 061 736 5822.

DX-135 PRINTER

Those in the market for a low cost printer should be interested in the DX-135 from Samleco.

The printer offers a 120 cps, 132 column, nine needle specification. It is sold with either a friction or push-pull tractor and can be interfaced to a range of computers via a series of plug-in interface cartridges.

Other features incorporated as standard include automatic paper loading, normal condensed and double width characters and the ability to produce hi-res graphics dumps. *More info from Mills Associates.*

CBM SOUND

From Supersoft comes news that the Microvox digital sound sampler is now available. This device offers eight different sampling speeds, the maximum being 42kHz with a bandwidth of 20kHz. A MIDI interface is built into the unit along with features such as two 24dB/octave tracking filters and software selectable compansion-type noise reduction. Available through your local computer shop, as are all Commodore products, the Microvox retails at £229.95.

Those keen to experiment with sound sampling but less keen on parting with £200, will be glad to hear that Datel has produced a sampler at the more reasonable price of £49.99. The Datel DSS is supplied as a hardware unit complete with system software. The unit allows sound to be recorded digitally and then to be replayed at any pitch, forwards, backwards, with echo, endlessly looped etc – all the usual tricks associated with this sort of equipment. *More info from Datel on 0782 273815.*

EPSON AT BOOTS

The Epson P-40 is now available from Boots at £59.95. The printer operates at 45 CPS and, using thermal paper, offers as standard a 40 column output, although 80 or 20 characters per line can also be printed by selecting condensed or enlarged print styles.

The P-40 is supplied in a number of different versions featuring serial and parallel interfaces plus a special version designed for use with Epson's own PX-8 portable micro. The printer is supplied with a mains adaptor, two rolls of paper and rechargeable batteries.

No contact this time, your local branch of Boots should have the printer in stock.

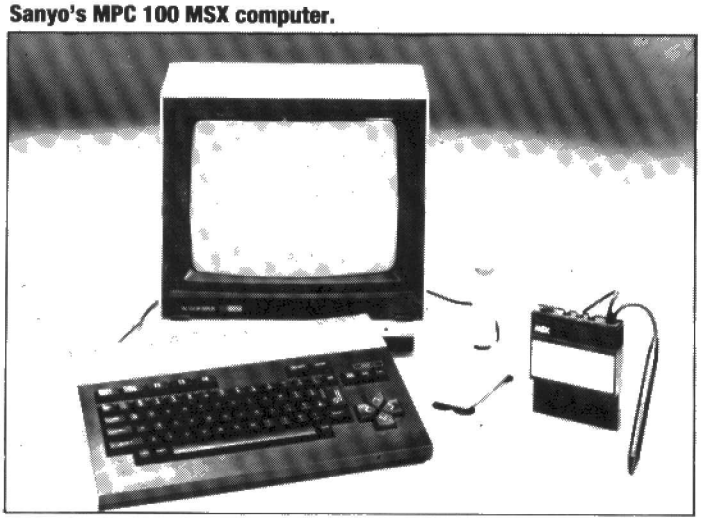
APRICOT MAIL

Apricot networks now has a £495 package called Apricot Mail, which provides an easy to use means of sending messages between any of the 64 computers which can be supported by the Network system. The initial implementation of the system allows any user to send mail to any other machine on the same network.

Apricot Mail builds in a variety of features designed to make the preparation and despatch of mail a straightforward job. The company are at present working on enhancements to the system: these will include the ability to access external services such as Telecom Gold

More info on 021 454 9091.

Sanyo's MPC 100 MSX computer.



New from Sanyo

Sanyo continues to maintain its interest in the low cost end of the micro market. They are the latest company to make educational establishments an offer that is difficult to refuse.

For an 'all-in' price of £699 (excluding VAT) they have launched a schools package that consists of a MBC555 micro, a hi-res green screen monitor, the CRT36, and a selection of software that includes Wordstar, Spellstar and Calcstar. Sanyo see the system as being of particular interest to higher education establishments who could use the equipment to form the basis of

ON THE WALL

The Brother 1509 is the latest printer from Brother, a printer with a novel feature. Much of the machine's specification matches that of many current printers. It has print speeds of 180 CPS, draft, and 45 CPS in NLQ mode. A 3K input buffer is fitted as standard as are both centronics and RS232 serial interfaces. The printer is also able to accept other, optional NLQ fonts, supplied as cartridges. At present three are available.

What's new is that this is, to our knowledge, the first printer that can be wall mounted. Wall hangers are fitted to the base of the printer, which allow it to be operated in a vertical position. This capability will be a boon for users operating in environments where space is at a premium. *More info 084 421 4561.*

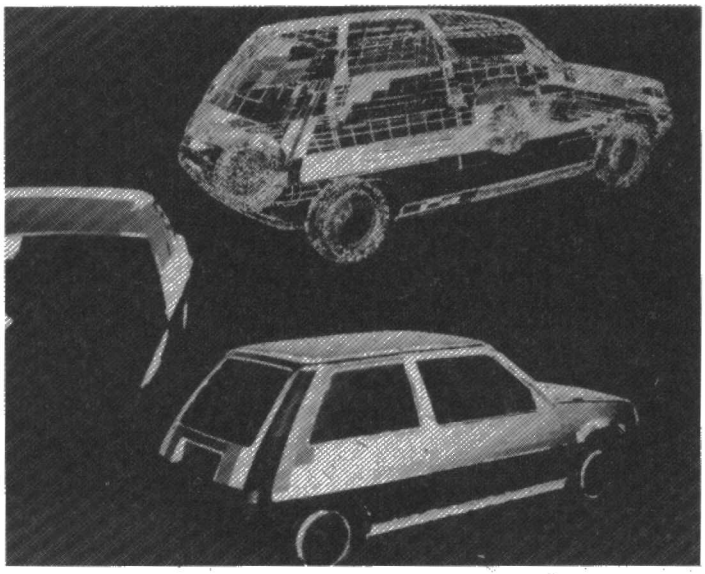
OPTICAL KEY

Yet another device that claims to offer software producers the answer to the problems of software piracy has hit the market. Lenslok is described by its manufacturers as the unique and cost effective way of protecting software against piracy.

'What is it?' asks the press release, before going on to describe the device as an 'optical key'. What is an optical key? Another good question, to which the answer is, a lens – not an ordinary lens you understand but one used in conjunction with software routines built into the software to be protected.

When loading software protected with Lenslok, the computer generates a random two letter sequence. The pattern of pixels that make up each letter is then scrambled and the result displayed on the screen. The scrambled pattern appears on screen for a couple of seconds during which time the lens is used to decode the pattern. The two letters, when typed into the computer, will unlock the program.

Looks good in theory, we await news of software houses adopting the system. *More info 01 248 4000.*



Proof that robots are now sensitive sculptors comes from French car manufacturer Renault. The company uses robot arms to sculpt conceptual models from plastic. Modelling time has been halved to six weeks by the three stage CAD (or in France, CAO – Conception Assistee par Ordinateur) process. The model is sculpted using the original 2D draught program which is automatically translated into three dimensions.

DRIVE AND RAMDISK

The Challenger from Opus is a new plug-in disk system for the BBC micro.

The stand-alone system has a built-in double density disk interface, based on the WD1770 FDC used in the B+, so it's very easy to fit. It simply plugs into the bus and auxilliary power outlet on the computer.

Software to support the drive is supplied in a sideways ROM. Challenger combines a double-sided 40/80 track disk drive, with a storage capacity of either 400 or 720K and a RAM disk that offers 0.25Mbytes of fast random access memory using 256K dynamic RAM ICs. The RAM disk is configured as a second disk drive making it appear as a very fast conventional drive. Price of the Challenger is £249.95. *More information on 0737 65080.*

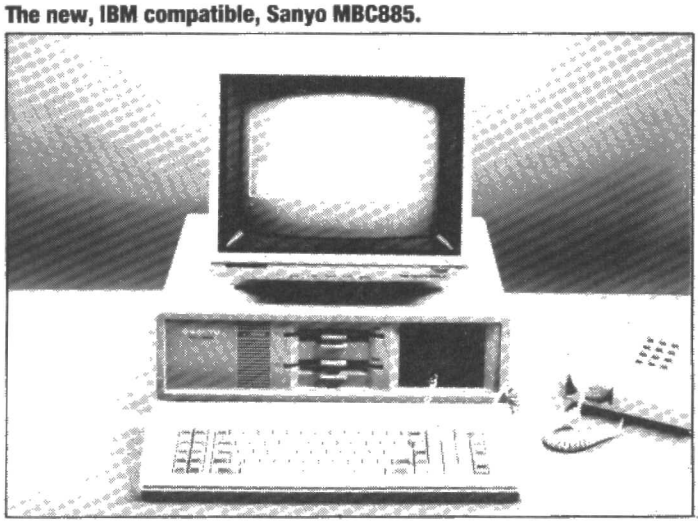
COLOUR PRINT

A new range of colour printers have been introduced by NEC. The CP2 (80 column) and CP3 (136 column) offer printing in seven colours in addition to black, making use of a four colour ribbon combined with overprinting.

The printers use an impact type 18-pin, 2 x 9 dot matrix print head in a staggered array that will print in three different modes – high speed at 180 cps, correspondence at 90 cps and NLG at 30 cps.

Seven founts are available from a set of switches mounted on the top surface of the printers, additional controls inform the operator of printer status. The printers are offered with a serial interface (3.5K buffer) as standard. A parallel (5.5K buffer) interface is also available. *More information from Impectron 0403 50111.*

The new, IBM compatible, Sanyo MBC885.



many business related courses.

The latest machine from Sanyo is the MBC885 with 'total IBM compatibility'. Operating under MS DOS 2.11 the MBC885 features 256K of RAM, expandable to 640K. Twin 360K drives are built into the computer which also provides seven expansion slots accepting standard IBM cards. Just to show that the company are covering all sections of the market, they have a stake in the MSX camp with their MPC100 computer. The address of your local Sanyo dealer can be obtained from the company on Watford 46363.

SOFTWARE Continued

Kuma Computers. Kuma intend to release this winter the **K-Spread** spreadsheet, **K-Seka** editor/assembler, **K- Data** database, **K-Word,** and **K-Comm,** a communications and Viewdata terminal package for use with Gem. Miracle Technology had a version of the Multi-Viewterm Prestel terminal software complete with the **Datatari** interface. The combined package allows use of 75/1200, 1200/75, 300/300 and 1200/1200 baud rates, giving access to bulletin boards and electronic mail as well as Viewdata.

That's enough Atari software.

It's gardening time. Latest **QL** package, taking pride of place on the Sinclair stand was **QL Gardener.** Some readers may regard this package to be of an appeal too limited to be given such prominence by the company, especially when it's a Spectrum's throw from all those Atari delights. As a keen horticulturalist I would take exception to such a suggestion.

For the same machine, **Meteor Storm,** by Arrakiis, and **Reversi** by Games of Skill, both marketed by Sinclair. Of more mpractical interest is the suite of **Integrated Accounting** packages written by Pert Software, now complete and priced at £49.95 each, not £89.95 as we stated in October's *Computing Age* (£179.95 for the entire set). Integrated Accounting includes Stock Control, Nominal Ledger, Purchase Ledger and Sales Ledger. *Contact 0460 42023.*

C fanatics, who are multiplying vigorously, can turn off from SuperBasic and onto **QC,** a 'standard' C (there is no standard C) for the QL from GST. This C compiler requires no extra RAM – it runs on a standard QL from Microdrives or disk, and includes QDOS runtime libraries, assembler, linker, and user manual. A menu-driven shell automates the compile/assemble/link process, and the editor includes a window manager to change the size and position of program windows. Wisely, to accommodate the accident-prone Microdrives, there is an automatic backup facility. QC is priced at £59.95. *Contact 0954 81991.*

Puzzle addicts will appreciate **Wordfinder** by WD Software, which assists crossword cheats by finding missing letters and solving anagrams of single words. Not a difficult programming task you might think, but Wordfinder has a 13,000 word vocabulary which is more than some journalists I know can boast of. *Contact 0534 81392.*

For the **BBC micro** Acorn announced announced a wordprocessor and a toolkit, both available on EPROM. **Protext** was written with Amstrad firmware in mind and easy configuration to a wide range of printers. The package, which is aimed at beginners, is priced at £39.95 in EPROM or £19.95 on tape.

Utopia (a programmer's dream?) was written by the author of Beebug's Toolkit BBC ROM. The Amstrad version has similar commands and utilities, including programming aids, file handling commands, disk user utilities and ROM manager commands. The EPROM is priced at £29.95. *Contact 01 688 6223.*

BRAINSTORMING

An ideas processor has more to do with project planning than artificial intelligence, but Simon Craven believes this to be a genuinely original software application.

Only very rarely does a genuinely new idea in microcomputer software appear. Instead of thinking up new applications, and new markets, software houses normally prefer to reinvent the wheel by churning out yet more word processors, databases and spreadsheets. One of the few original ideas of the last couple of years is the so-called ideas processor.

The first example to meet the public eye was *Brainstorm,* from Caxton, a program evolved by author Dave Tebbut to help him run PCW magazine at the time of his editorship. Independent development in the US resulted in the launch of *Thinktank,* which is now in its second major revision, and has developed into a sophisticated alternative to Brainstorm. Thinktank is available only for the IBM PC/AT or a true compatible with a minimum of 256K of RAM. Brainstorm is rather smaller and simpler, and versions can be had for most popular disk-based business micros.

These packages are intended to fill the same job as the A4 jotter pad: writing down shopping lists, names and addresses, outlines for any kind of written work, agendas for business meetings and the like. If that seems like a rather trivial thing for a £1500 computer to do, think again.

A conventional word processor scores over a typewriter because it does not commit the text to paper until it is finished. You can quickly manipulate words or blocks of text because the medium of computer memory is far more flexible than paper. An ideas processor also uses the flexibility of RAM, but in a different way. What it does is to make your notional A4 pad multi-dimensional, so that instead of just writing lists of things to do, you can attach to each entry another list, comprising all the items which make up that particular entry on the top list. For example, let's say you are planning to launch a new brand of soap on to an unsuspecting world. Your task can be broken down into four main areas: identify what the public really wants from its soap, manufacture something suitable, arrange distribution through the right kind of wholesale and retail outlets, and promote the product using the usual marketing and advertising techniques.

If you do your thinking with the back of an envelope and a biro you now have a problem. You are out of space, and there is nowhere to write down all the wonderful ideas which are rushing to the front of your mind. Even the full-blown A4 pad has severe limitations: you end up with lots of jottings but it is difficult or impossible to keep in your mind an overall picture of what belongs where, and how all these pieces of information relate to each other. Another problem is that all these notes will have to be rewritten and typed up before you can communicate your ideas to your colleagues.

IDEAS ON TAP

Using the Brainstorm/Thinktank method, you type in your ideas as you think them up, in much the same way, but the software keeps track of all the information you enter and builds it into a coherent structured model. With Thinktank, for example, you type in those four areas of your soap business which require action:

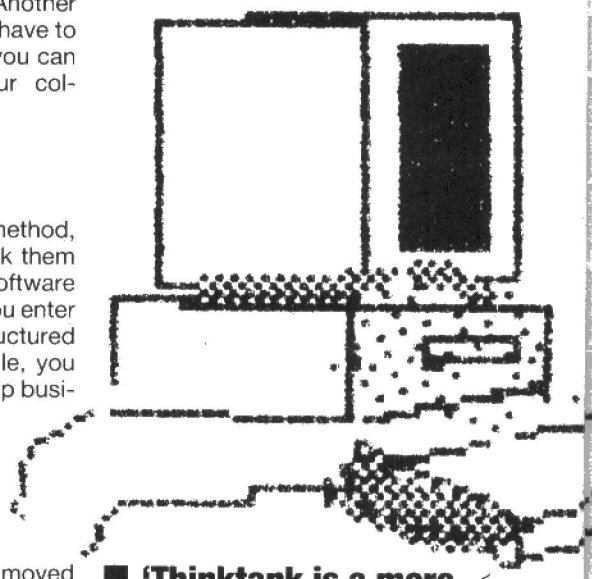
Market research
Set up manufacturing facility
Arrange distribution
Marketing drive

An inverse-video bar cursor can be moved up and down the list to select whichever entry you want to expand first. To choose "Market Research", you position the bar cursor and hit the plus key. A space opens up between the first two entries and you start typing in a more detailed version. Each of these new entries is automatically indented, so the display looks like this:

Market research
  Commission survey
  Identify rivals
  'Blind testing' of new ideas on volunteers
Set up manufacturing facility
Arrange distribution
Marketing drive

You might then wish to expand one of these new entries in turn. As you build up more and more detail the indentation gets deeper and deeper until the whole display starts scrolling horizontally. The only limit to the number of layers of information you can have is the memory of the computer.

With a bit of imagination and hard work, the information you have entered quickly overflows the 80 x 25 character screen, which naturally makes it difficult to remind yourself of the overall picture. Fortunately, pressing the minus key on a given heading instantly 'collapses' all the sub-entries to that heading. They disappear from the screen, but stay in memory, so that any time you want to refer to that part of the model again you can just press the plus key over the appropriate heading and the entries will reappear.



'Thinktank is a more sophisticated program than the spartan Brainstorm, and includes a high quality text editor'

Brainstorm works a little differently. It uses the same principle of structured layers of lists, but you can only have one level of information on the screen at a time. Each screen of a Brainstorm model is like one card in a card index. If you were building up the same soap plan, you would start with the four initial areas of concern on the top 'card'. To expand one of the areas you 'promote' it using CTRL-R, so that the screen clears and you are presented with a blank card with that heading as a title. To 'demote' the new card once you have finished with it, press CTRL-C, and you snap up one level in the tree structure.

TEXT EDITING TOO

Thinktank is a much more sophisticated program than the rather spartan Brainstorm. It is lavishly equipped with bells and whistles which may or may not be

useful but certainly make for long happy hours exploring the manual. One feature which really does make Thinktank more useful is its document editor. This is a high-quality text editor which can be used to create, edit or print documents of up to a few thousand words in length. These documents are incorporated into the main Thinktank model where appropriate, so that letters or memoranda can be produced without interrupting the flow of your planning effort.

Users of heavyweight WP packages might find this part of Thinktank a bit less potent than their usual programs. It misses out on spelling checking, mail merge, and other features often found in packages intended more for secretarial rather than personal use. Given the context in which Thinktank is likely to be used, these are not serious failings – it offers competent basic editing facilities including block operations, search and replace, and a fair selection of formatting controls. It is certainly good enough for letters and shortish magazine articles, to take two examples.

Another benefit of Thinktank is that it is beautifully configured to make use of the PC keyboard. All the function keys are used for example. Brainstorm is supplied completely unconfigured – if you want to use the cursor keys instead of Wordstar-style control key sequences, you will have to do the work yourself, possibly using a keyboard enhancement utility such as Prokey or Keyworks.

If your computer is not IBM PC compatible then Brainstorm is worth considering. It is especially good for organisational work, where its limited text editing facilities do not matter much. Thinktank, in its new version 2.00, has been developed into a much more complete and mature package. It is obviously well written, and well documented.

'Don't have false expectations – an ideas processor isn't a fortune teller'

The one factor against Thinktank is potentially serious, however – it is supplied only on a copy-protected disk. If you are a registered user you can send off for a duplicate, but it would still be a brave decision to lock yourself into using this system. Even well-run software companies can run into commercial problems, and if replacement program disks became unavailable you would eventually find yourself with a lot of information stored in Thinktank workfiles and no way to access it. All diskettes wear out eventually, and there are too many ways to wipe them out accidentally for comfort.

The minimum of 256K required to run this program should really be regarded as just that – a minimum. If you want to keep memory-resident programs available at the same time as running Thinktank, you will need correspondingly more RAM. Using PC-DOS 3.00, Sidekick, PRINT.COM and Keyworks, 512K was the minimum usable configuration.

THINKING MAN'S QL

Unfortunately the ideas processor idea has not yet spread to the 'home' micro field, but two packages for the QL come close.

The first, Project Planner, is based on the PERT principle. PERT is a system developed by the construction industry for timing the many parallel processes involved in building a road, bridge, or plant. Each job is given a description, duration and a cost to completion. Where one job is dependent upon others finishing, this must be specified and is then taken into account by the software. The theory of Critical Path Analysis is applied to create a horizontal bar chart giving the overall duration of the project, highlighting the jobs which are critical to the completion date, and showing those where a degree of slack is available.

Decision Maker, on the other hand, provides an ordered framework for evaluating problems. A tree of consequences, stemming from an original decision, is built up by the software. Branching occurs whenever further decisions have to be made or when a chance event occurs.

A monetary value is ascribed to each event to determine its probability (the software uses statistical decision analysis techniques). For example, you are faced with a decision: publish or not to publish a potentially libellous statement. If you publish, the consequences will be: you are taken to court; or no action is taken. If you do not publish there is only one consequence – you are damned. But if you do and are taken to court there are three consequences: paying damages and costs; settlement out of court; or you win the case, etc. etc.

Obviously the software is not clever enough to ascribe the probabilities itself – that's a job for the user. The program uses such concepts as Bayes Theorum, Expected Monetary Value, EVSI and Maximum; these are all explained in the manual. The end result is a decision tree with up to 149 nodes and five branches to each node. An optimum course of action is highlighted and displayed in one window. Another window can be used to zoom in on a particular node.

Don't have false expectations: ideas processors are not fortune tellers. But they are a valuable tool for giving a structure to complex ideas or processes.

PRINTOUT

Each month *Computing Age* will publish utility, graphics, communications and business software for a range of home computers, including the BBC Micro, Sinclair QL, Amstrad, CBM64, Atari 520ST, CP/M and MS DOS machines.

This month we feature a brace of programs for the BBC micro, an elegant program that turns the computer into a Viewdata terminal and software that allows for an elegant recovery from a BAD PROGRAM error.

Two programs for the QL too, a routing for data encryption and a machine code loader that adds complementary text compression and expansion string functions to the computer.

We want **you** to write for this column. If you have written software for any of the above machines then send it to *Computing Age*. We pay £75 per published page, as long as the listing meets the following requirements:

Listings should be set over a maximum width of 40 columns. Each listing should include an explanation of how the software operates, of between 200 and 400 words length. Your submission should be accompanied by a disk or cassette, and a clear printout of the listing. Please include a stamped self-addressed envelope so that the software can be returned if it is unsuitable for publication. *Computing Age* cannot accept responsibility for loss or damage to software submitted.

Send your software to: PRINTOUT, *Computing Age*, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

Viewdata Terminal

How to turn a BBC micro into a Prestel viewdata in two (yes, two) lines of Basic

BBC

The Beeb's 16K operating system is well endowed with access channels to dedicated hardware control, for example the video and sound chips, via OSBYTE or *FX calls. These are very easily accessible from BBC Basic and access to the Beeb's RS423 serial interface is a perfect example of this. With liberal use of *FX calls it's possible to write a simple Terminal program in as little as *two* lines of Basic, without having to resort to any machine-code!

We've chosen to emulate a Prestel/Viewdata terminal using the Beeb's very convenient Mode 7, viewdata compatible, alpha-mosaic display mode. Listing 1 shows the program in exactly two lines of BBC Basic, however for clarity, the program has been expanded in Listing 2.

In Listing 2, line 10, *FX7,4 sets the RS423 to 1200 baud receive. Line 20: *FX8,1 sets the RS423 to 75 baud transmit.

The program is an infinite loop testing for characters coming into the RS423 from the remote computer (Prestel) and also characters coming from the keyboard. Line 110: *FX2,2 switches input from the keyboard on. As sampling needs to be very quick, INKEY(0) is used throughout and there is no waiting around if no characters have been received. Line 130: *FX3,7 enables output to the RS423 out only (back to Prestel). Line 140: If a key is pressed it's ANDed to remove the possibility of it's ASCII value exceeding 127 and confusing Prestel. Line 180: *FX2,1 gets characters from the RS423 port (from Prestel). Line 140: *FX3,4 means that characters received can then be printed to the screen only. Lines 210 through 250 ensure that characters received from the remote computer are correct (control codes for example) and that they don't end up scrolling the screen.

Listing 1 will work but suffers from RS423 buffer overflow, so characters tend to get lost at the end of a frame causing screen corruption. This is because Basic isn't quite fast enough to empty the buffer before an overflow condition occurs.

Listing 2 is less prone to this because the code is more efficient and thus faster (no unnecessary repetition of *FX calls, plus the more efficient use of PROCedures rather than GOTOs).

To use the Terminal, dial up Prestel, wait for a carrier, run the program and switch on-line. Use "*" normally, but for "#" press the "underline" key (same as £ sign).

MIKE BROWN, IAN BURLEY

LISTING 1

```
>
>
>L.
    1 OSCLI("FX7,4"):OSCLI("FX8,1"):OSCL
I("FX2,1"):P%=INKEY(0):IFP%=-1THEN2ELSEO
SCLI("FX3,4"):P%=P%AND127:IFP%=27 VDU(64
+(127AND INKEY(0)))ELSEIFP%>31VDUP%+128E
LSEIFP%=11ANDPOS=0ANDVPOS=0 VDU31,0,23EL
SEIFVPOS=23ANDP%=10 VDU31,POS,0ELSEVDUP%
    2 OSCLI("FX2,2"):K%=INKEY(0):IF K%=-
1THEN1 ELSEOSCLI("FX3,7"):VDUK%AND127:GO
TO1
```

LISTING 2

```
>
>
>L.
   10  *FX7,4
   20  *FX8,1
   30  REPEAT
   40        PROCprestelcharin
   50        PROCkbdcharout
   60    UNTIL FALSE
   70  END
   80  REM ******************************
   90  DEF PROCkbdcharout
  100  LOCAL K%
  110  *FX2,2
  120  K%=INKEY(0):IF K%=-1 THEN ENDPROC
  130  *FX3,7
  140  VDU K% AND 127:ENDPROC
  150  REM ******************************
  160  DEF PROCprestelcharin
  170  LOCAL P%
  180  *FX2,1
  190  *FX3,4
  200  P%=INKEY(0):IF P%=-1 THEN ENDPROC
  210  P%=P% AND 127
  220  IF P%=27 THEN VDU 64+(127 AND INK
EY(0)):GOTO 200
  230  IF P%=11 AND POS=0 AND VPOS=0 THE
N VDU31,0,23:GOTO 200
  240   IF P%=10 AND VPOS=23 THEN VDU31,
POS,0:GOTO 200
  250  IF P%<32 THEN VDU P% ELSE VDU P%+
128
  260  GOTO 200
  270  REM ******************************
*
```

Retrieve

A short utility to retrieve Basic programs once a BAD PROGRAM error has been generated.

BBC

The BAD PROGRAM error can occur while loading the program or if a conflict of

memory occurs. The only way out is to try and reload the program or start typing again! This utility program will only recover as much of the program that makes sense to the computer, therefore not all the program may be retrieved. Better than nothing though if you have to retype the program.

PROCget_addr asks for the address of the program to be recovered. This is the value of PAGE, usually &1900 for disk users or &0E00 for tape users. The FOR NEXT loop at line 180 is executed four times, once for each character of the address. The three IF THEN statements at lines 210, 220 and 230 calculate the address depending upon the character entered. The variable addr% is the start address.

Line 260 tests for the start of Basic line marker &0D (13 in decimal). If addr% does not contain &0D then the program cannot continue.

PROCsearch searches through the program until it cannot make sense of the data. In every Basic line &0D is the start of line marker. The next two locations are the Hi and Lo bytes of the line number. The data in the third location from the &0D marker is the number of bytes used to store the Basic line. If this data is added to the current &0D address (addr%) then the result is the address of the next start of Basic line marker, &0D. PROCprint calculates the line number and prints it on the screen. Hence lines 340 to 380 continue to be executed until fault is set TRUE (contents of nextaddr% <> &0D).

Line 120 inserts an end of Basic program marker (&FF) once the computer cannot make sense of the program.

Line 130 prints the last line number and the total number of lines recovered.

To use the program the variable PAGE should be set to a value greater than TOP then this program should be chained.

STUART CORNER

BBC RETRIEVE

```
   10 REM          RETREVE
   20
   30 REM To retrieve a basic progr
am
   40 REM that has caused a BAD PRO
GRAM
   50 REM error.
   60
   70 REM Stuart Corner 13th Sept 1
985
   80
   90 MODE7
  100 PROCget_addr
  110 PROCsearch
  120 ?(addr%+1)=&FF
  130 PRINTTAB(0,7)"Last line numbe
r = ";lineno%''"Recovered ";lines%-
1;" lines"
  140 END
  150
  160 DEFPROCget_addr
  170 addr%=0
  180 FOR B%=1 TO 4
  190   PRINTTAB(0,4);"Start addres
s of program &";~addr%;"    "
  200   A%=GET
  210   IF A%=127 THEN addr%=addr%D
IV16:B%=B%-2
  220   IF A%>=48 AND A%<58 THEN ad
dr%=addr%*16+A%-48
  230   IF A%>64 AND A%<71 THEN add
r%=addr%*16+A%-55
  240   NEXT B%
  250 PRINTTAB(26,4);~addr%
  260 IF ?addr%<>13 THEN PRINT''"Fa
iled at 1st address (&";~?addr%;")"
:END
  270 ENDPROC
  280
  290 DEFPROCsearch
  300 PRINT''"Checking line no ";
  310 fault=FALSE
  320 lines%=0
  330 lineno%=0
  340 REPEAT
  350   lines%=lines%+1
  360   nextaddr%=addr%+?(addr%+3)
  370   IF ?nextaddr%=13 THEN PROCp
rint:addr%=nextaddr% ELSE fault=TRU
E
  380   UNTIL fault=TRUE
  390 ENDPROC
  400
  410 DEFPROCprint
  420 lineno%=256*?(addr%+1)+?(addr
%+2)
  430 PRINTTAB(17,7);lineno%
  440 ENDPROC
>
```

Data Encryption

Encrypting QL data files against unauthorised access – or how to beat the hackers.

QL

As Paul Beverley showed in a recent issue of *Computing Age's* predecessor, Electronics and Computing Monthly, a simple way of encrypting datafiles against unauthorised access is by performing an Exclusive Or on bytes of data, so that to decode such bytes it is only necessary to go through the Exclusive Or operation again. It is easy to show, however, that using one byte as the 'key' in the exclusive-or process provides a very low level of security, hence a 'key' of several bytes is required. This multitasking program for the QL uses a four-byte key to encode the file and allows the user to specify input and output file names as well as the key for coding. The routine is full, error trapped.

The program in listing one can be entered using an assembler or the more 'manual' hexloader of listing two can be used. Note that the assembler listing contains no macros and that all vectors have been given as their true values (as my assembler demands this!). When you have assembled the program of listing one SEXEC it with 150 bytes of dataspace. The SuperBasic program in listing two can be typed in and eventually run to POKE the code into memory, but be careful as there are no checksums involved; it will SAVE itself on being run (in case there are any errors in it and it has to be reloaded after a reset).

To use the program you must EXEC the file created by the SEXEC command. To change from the SuperBasic console to the encryptor console press CTRL-C and then reply to the prompts as normal. You return to SuperBasic after the job has killed itself by again using CTRL-C.

If you wish to see the routine's results use the COPY command. For example, if you have a file to be coded called 'original_data' and have coded it into 'coded_data' and decoded it back into 'decoded_data' then you can see this with:-

COPY mdv1_data to SCR_
(to see the original data)
COPY mdv1_coded_data to SCR_
(to see the coded data)
COPY mdv1_decoded_data to SCR_
(to see the decoded data)

If these programs are to be used successfully for the exchange of data eg via network, telephone or even by microdrive cartridges in the mail then clearly both users *must* use the same key.

CHRIS BAXTER

LISTING 1

```
3FA30                   * Multitasking encryption routine
3FA30                   * C.I.Baxter 31/08/85
3FA30 6010                      BRA.S   START
3FA32 00000000
                                DC.L    0
3FA36 4AFB
                                DC.W    $4AFB
3FA38 0007
                                DC.W    7
3FA3A 454E43525950540
                                DC.B    'ENCRYPT',0
3FA42                   * Set priority of job
3FA42 700B              START   MOVEQ   #$B,D0
3FA44 72FF                      MOVEQ   #-1,D1
3FA46 7401                      MOVEQ   #1,D2
3FA48 4E41                      TRAP    #1
3FA4A                   * Open console channel
3FA4A 43FA013A                  LEA     PBLOK,A1
3FA4E 347800C6                  MOVE.W  $C6,A2
3FA52 4E92                      JSR     (A2)
3FA54 4A80                      TST.L   D0
3FA56 660000CA                  BNE     ERR
3FA5A                   * Get input file and open it
3FA5A 43FA00F2          GETFL   LEA     MESS1,A1
3FA5E 6100011E                  BSR     OUT
3FA62 610000CA                  BSR     FCHAN
3FA66 2F08                      MOVE.L  A0,-(A7)
3FA68 610000D2                  BSR     NEXT
3FA6C 7601                      MOVEQ   #1,D3
3FA6E 610000D6                  BSR     OPEN
3FA72 4A80                      TST.L   D0
3FA74 670A                      BEQ.S   GOTIT
3FA76 205F                      MOVE.L  (A7)+,A0
3FA78 347800CC                  MOVE.W  $CC,A2
3FA7C 4E92                      JSR     (A2)
3FA7E 60DA                      BRA.S   GETFL
3FA80 225F              GOTIT   MOVE.L  (A7)+,A1
3FA82 2F08                      MOVE.L  A0,-(A7)
3FA84 2049                      MOVE.L  A1,A0
3FA86                   * Get output file and open it
3FA86 43FA00D6          GTOUT   LEA     MESS2,A1
3FA8A 610000F2                  BSR     OUT
3FA8E 6100009E                  BSR     FCHAN
3FA92 2F08                      MOVE.L  A0,-(A7)
3FA94 610000A6                  BSR     NEXT
3FA98 7602                      MOVEQ   #2,D3
3FA9A 610000AA                  BSR     OPEN
3FA9E 4A80                      TST.L   D0
3FAA0 670A                      BEQ.S   GOTOUT
3FAA2 205F                      MOVE.L  (A7)+,A0
3FAA4 347800CC                  MOVE.W  $CC,A2
3FAA8 4E92                      JSR     (A2)
3FAAA 60DA                      BRA.S   GTOUT
3FAAC 225F              GOTOUT  MOVE.L  (A7)+,A1
3FAAE 2F08                      MOVE.L  A0,-(A7)
3FAB0 2049                      MOVE.L  A1,A0
3FAB2                   * Now get coding key
3FAB2 43FA00BA          KEY     LEA     MESS3,A1
3FAB6 610000C6                  BSR     OUT
3FABA 61000072                  BSR     FCHAN
3FABE 2F08                      MOVE.L  A0,-(A7)
3FAC0 6100007A                  BSR     NEXT
```

```
3FAC4 0C500004                  CMPI.W  #4,(A0)
3FAC8 670A                      BEQ.S   GOON
3FACA 205F                      MOVE.L  (A7)+,A0
3FACC 347800CC                  MOVE.W  $CC,A2
3FAD0 4E92                      JSR     (A2)
3FAD2 60DE                      BRA.S   KEY
3FAD4 5448              GOON    ADDQ    #2,A0
3FAD6 225F                      MOVE.L  (A7)+,A1
3FAD8 2F08                      MOVE.L  A0,-(A7)
3FADA                   * Close console channel
3FADA 2049                      MOVE.L  A1,A0
3FADC 7002                      MOVEQ   #2,D0
3FADE 4E42                      TRAP    #2
3FAE0                   * Loop to EOR data
3FAE0 7800                      MOVEQ   #0,D4
3FAE2 206F0008          CIRC    MOVE.L  8(A7),A0
3FAE6 76FF                      MOVEQ   #-1,D3
3FAE8 7001                      MOVEQ   #1,D0
3FAEA 4E43                      TRAP    #3
3FAEC 4A80                      TST.L   D0
3FAEE 6622                      BNE.S   CLOSE
3FAF0 2257                      MOVE.L  (A7),A1
3FAF2 D3C4                      ADDA.L  D4,A1
3FAF4 1411                      MOVE.B  (A1),D2
3FAF6 B501                      EOR.B   D2,D1
3FAF8 206F0004                  MOVE.L  4(A7),A0
3FAFC 76FF                      MOVEQ   #-1,D3
3FAFE 7005                      MOVEQ   #5,D0
3FB00 4E43                      TRAP    #3
3FB02 5244                      ADDQ    #1,D4
3FB04 0C8400000004              CMPI.L  #4,D4
3FB0A 6602                      BNE.S   CONT
3FB0C 7800                      MOVEQ   #0,D4
3FB0E 6000FFD2          CONT    BRA     CIRC
3FB12                   * Close in and out channels
3FB12 205F              CLOSE   MOVE.L  (A7)+,A0
3FB14 205F                      MOVE.L  (A7)+,A0
3FB16 7002                      MOVEQ   #2,D0
3FB18 4E42                      TRAP    #2
3FB1A 205F                      MOVE.L  (A7)+,A0
3FB1C 7002                      MOVEQ   #2,D0
3FB1E 4E42                      TRAP    #2
3FB20 6006                      BRA.S   END
3FB22 347800CA          ERR     MOVE.W  $CA,A2
3FB26 4E92                      JSR     (A2)
3FB28                   * Kill this job
3FB28 7005              END     MOVEQ   #5,D0
3FB2A 72FF                      MOVEQ   #-1,D1
3FB2C 4E41                      TRAP    #1
3FB2E                   * Job now killed
3FB2E                   * Channel fetching routine
3FB2E 7464              FCHAN   MOVEQ   #100,D2
3FB30 76FF                      MOVEQ   #-1,D3
3FB32 43FA0060                  LEA     BUFF,A1
3FB36 7002                      MOVEQ   #2,D0
3FB38 4E43                      TRAP    #3
3FB3A 4E75                      RTS
3FB3C                   * Channel fetching (cont.)
3FB3C 41FA0054          NEXT    LEA     BUFFP,A0
3FB40 5341                      SUBQ    #1,D1
3FB42 3081                      MOVE.W  D1,(A0)
3FB44 4E75                      RTS
3FB46                   * Open channel routine
3FB46 7001              OPEN    MOVEQ   #1,D0
3FB48 72FF                      MOVEQ   #-1,D1
3FB4A 4E42                      TRAP    #2
3FB4C 4E75                      RTS
3FB4E 000E
                        MESS1   DC.W    14
3FB50 456E63727970742066696C653A20
                                DC.B    'Encrypt file: '
3FB5E 000E
                        MESS2   DC.W    14
3FB60 4F757470757420206696C653A20
                                DC.B    'Output  file: '
3FB6E 000E
                        MESS3   DC.W    14
3FB70 476976652068657977 6F72643A20
                                DC.B    'Give keyword: '
3FB7E                   * Print message routine
3FB7E 347800D0          OUT     MOVE.W  $D0,A2
3FB82 4E92                      JSR     (A2)
3FB84 4E75                      RTS
3FB86                   * Console channel parameter block
3FB86 07
                          PBLOK   DC.B    7
3FB87 02
                                  DC.B    2
3FB88 00
                                  DC.B    0
3FB89 04
                                  DC.B    4
3FB8A 01BD
                                  DC.W    445
3FB8C 0028
                                  DC.W    40
3FB8E 0022
                                  DC.W    34
3FB90 000F
                                  DC.W    15
3FB92                   * Buffer for filenames
3FB92 0000
                        BUFFP   DC.W    0
3FB94                   BUFF    DS.B    100
3FBF8                           END
```

LISTING 2

```
100 REMark Data Encryption program
110 REMark copyright C.I.Baxter 1985
120 a=RESPR(456)
130 RESTORE
140 FOR i=0 TO 455
150 READ x
160 POKE i+a,x
170 END FOR i
180 SAVE mdv1_encrypt_ldr
190 SEXEC mdv1_encrypt_etp,a,456,150
200 STOP
210 DATA 96,16,0,0,0,0,74,251,0,7
220 DATA 69,78,67,82,89,80,84,0,112,11
230 DATA 114,255,116,1,78,65,67,250,1,58
240 DATA 52,120,0,178,78,146,74,128,102,0
250 DATA 0,202,67,250,0,242,97,0,1,30
260 DATA 97,0,0,202,47,8,97,0,0,210
270 DATA 118,1,97,0,0,214,74,128,103,10
280 DATA 32,95,52,120,0,204,78,146,96,218
290 DATA 34,95,47,8,32,73,67,250,0,214
300 DATA 97,0,0,242,97,0,0,158,47,8
310 DATA 97,0,0,166,118,2,97,0,0,170
320 DATA 74,128,103,10,32,95,52,120,0,204
330 DATA 78,146,96,218,34,95,47,8,32,73
340 DATA 67,250,0,186,97,0,0,198,97,0
350 DATA 0,114,47,8,97,0,0,122,12,80
360 DATA 0,4,103,10,32,95,52,120,0,204
370 DATA 78,146,96,222,84,72,34,95,47,8
380 DATA 32,73,112,2,78,66,120,0,32,111
390 DATA 0,8,118,255,112,1,78,67,74,128
400 DATA 102,34,34,87,211,196,20,17,181,1
410 DATA 32,111,0,4,118,255,112,5,78,67
420 DATA 82,68,12,132,0,0,0,4,102,2
430 DATA 120,0,96,0,255,210,32,95,32,95
440 DATA 112,2,78,66,32,95,112,2,78,66
450 DATA 96,6,52,120,0,202,78,146,112,5
460 DATA 114,255,78,65,116,100,118,255,67,250
470 DATA 0,96,112,2,78,67,78,117,65,250
480 DATA 0,84,83,65,48,129,78,117,112,1
490 DATA 114,255,78,66,78,117,0,14,69,110
500 DATA 99,114,121,112,116,32,102,105,108,101
510 DATA 58,32,0,14,79,117,116,112,117,116
520 DATA 32,32,102,105,108,101,58,32,0,14
530 DATA 71,105,118,101,32,107,101,121,119,111
540 DATA 114,100,58,32,52,120,0,208,78,146
550 DATA 78,117,7,2,0,4,1,189,0,40
560 DATA 0,34,0,15,0,0,0,0,0,0
570 DATA 0,0,0,0,0,0,0,0,0,0
580 DATA 0,0,0,0,0,0,0,0,0,0
590 DATA 0,0,0,0,0,0,0,0,0,0
600 DATA 0,0,0,0,0,0,0,0,0,0
610 DATA 0,0,0,0,0,0,0,0,0,0
620 DATA 0,0,0,0,0,0,0,0,0,0
630 DATA 0,0,0,0,0,0,0,0,0,0
640 DATA 0,0,0,0,0,0,0,0,0,0
650 DATA 0,0,0,0,0,0,0,0,0,0
660 DATA 0,0,0,0,0,0
```

Text Compression

A machine code loader for text compression and expansion

QL

This machine code loader adds two complimentary string functions COMP$ and EXPND$ which perform text compression and expansion respectively. Each has a single argument, the text string to be compressed or expanded; for example call COMP$(a$).

There are two limitations. First, strings passed to COMP$ must be shorter than 256 bytes. If you wish to handle longer strings reserve more buffer space and adjust the buffer pointers 'pbuf1' and 'pbuf2'. Secondly, the argument passed to COMP$ must only contain ASCII codes 0-127. Codes 128-254 are used to represent strings up to 4 characters long in the compressed text. If these are contained in text to be compressed, the string will be corrupted on expansion. The range of codes used may be changed by changing the variable 'base' and adjusting the number of text entries in the DATA statements. Please note that neither of these restrictions is checked by the machine code to allow changes to be made to the required limits.

The performance of text compression routines of the simple token type (such as this one) depends upon the match between the target text and the dictionary phrases. For example, the supplied dictionary performs miserably on predominantly upper case text but averages 60-70% compression on predominantly lower case text. Optimising the phrases in the dictionary is straightforward providing the grouping of strings of equal length is maintained and you remember to use the same dictionary for expansion and compression.

Finally, if you've never added functions to SuperBasic it is vital to remember that SuperBasic must not be given a reference to the additional function before it is linked in (by executing the machine code). Thus a couple of innocent looking test statements added to the loader can cause a lot of unexpected problems because SuperBasic analyses a program as it is being loaded, incorrectly classifying the test function calls.

R. K. LOWRY

QL TEXT COMPRESSION

```
100 REMark **
110 REMark ** Addition of text compression
120 REMark ** to Basic.
130 REMark **
140 REMark ** COMP$ (a$)  - compresses a$
150 REMark ** EXPND$(a$) - expands a$
160 REMark **
```

```
170 REMark ** (C) R.K. Lowry
240 REMark **
250 DIM array(5)
260 CLS:CLS#0
270 REMark **
280 REMark ** Reserve space for the dictionary
290 REMark ** (512 bytes) and m/c buffers.
300 REMark **
310 pdic=RESPR(1024):pbuf1=pdic+512:pbuf2=pbuf1+25
6
320 REMark **
330 REMark ** Reserve space for the
340 REMark ** machine code
350 REMark **
360 address=RESPR(1024)
370 REMark **
380 REMark ** Poke in the machine code
390 REMark **
400 RESTORE :PRINT "Loading machine code"
410 REPeat mcload
420   READ nwords
430   IF nwords<=0 THEN
440     PRINT"Load complete"
450     EXIT mcload
460     END IF
470   csum=0
480   FOR i=0 TO nwords-1
490     READ array(i):csum=csum+array(i)
500     NEXT i
510   READ csum2
520   IF csum<>csum2 THEN
530     PRINT"Checksum error"
540     PRINT"Correct checksum",csum2
550     PRINT"Line of data"
560     FOR i=0 TO nwords-1:PRINT,array(i);",";:NE
XT i
570     STOP
580     END IF
590   FOR i=0 TO nwords-1

600     POKE_W address,array(i):address=address+2
610     NEXT i
620   END REPeat mcload
630 REMark **
640 REMark ** Poke the dictionary and buffer
650 REMark ** addresses into the machine
660 REMark ** code data area.
670 REMark **
680 POKE_L RESPR(0)+4,pdic:POKE_L RESPR(0)+8,pbuf1
690 POKE_L RESPR(0)+12,pbuf2
700 REMark **
710 REMark ** Poke in the dictionary
720 REMark **
730 base=128:PRINT"Loading dictionary"
740 address = pdic+4:nbytes=4:symb=base-1
750 POKE pdic,base
760 charset(4)
770 POKE pdic+1,symb+1
780 charset(3)
790 POKE pdic+2,symb+1
800 charset(2)
810 POKE pdic+3,symb+1
820 REMark **
830 REMark ** Link in the new procedures
840 REMark ** and leave the machine ready
850 REMark ** for use.
860 REMark **
870 CALL RESPR(0):NEW
880 REMark **
890 REMark ** This procedure copies a segment
900 REMark ** of the dictionary into RAM.
910 REMark **
920 DEFine PROCedure charset (length)
930   REPeat char4
940   READ char$
950   IF char$="z" THEN EXIT char4
960   symb=symb+1
970 IF symb>254 THEN FLASH 1:PRINT"Symbol exceeds
254":STOP
980   FOR i=1 TO length
990   POKE address,CODE(char$(i))
1000   address = address+1
1010   nbytes  = nbytes+1
1020   NEXT i
1030   END REPeat char4
1040 END DEFine
1050 DATA 6,24576,44,3,-3072,3,-1024,20530
1060 DATA 6,3,-2048,0,0,0,0,-2045
1070 DATA 6,2,202,1347,20301,20516,26,42394
1080 DATA 6,1605,22608,20036,9216,0,17402,70867
1090 DATA 6,-28,13432,272,20114,28672,20085,82547
1100 DATA 6,28913,-17461,26368,108,8814,88,46830
1110 DATA 6,13432,278,20114,19072,26112,92,79100
1120 DATA 6,28913,3139,1,26112,82,17914,76161
1130 DATA 6,-92,9322,4,24832,240,17914,52220
1140 DATA 6,-104,8274,9834,4,10858,8,28874
1150 DATA 6,24832,54,21377,10241,22145,-7543,71106
1160 DATA 6,-7287,10753,13432,282,20114,8814,46108
1170 DATA 6,88,-27707,11593,88,8708,17914,10684
1180 DATA 6,-152,9322,4,24832,224,30721,64951
1190 DATA 6,28672,8814,88,20085,9291,10317,77267
1200 DATA 6,17026,5146,18946,27392,8,6338,74856
1210 DATA 6,24576,-12,-19396,255,26368,18,31809
1220 DATA 6,24832,424,6361,21313,26112,-6,79036
1230 DATA 6,24576,-36,6338,24832,280,20085,76075
1240 DATA 6,28913,-17461,26368,108,8814,88,46830
1250 DATA 6,13432,278,20114,19072,26112,92,79100
1260 DATA 6,28913,3139,1,26112,82,17914,76161
1270 DATA 6,-260,9322,4,24832,72,17914,51884
1280 DATA 6,-272,8274,9834,4,10858,8,28706
1290 DATA 6,24832,124,21377,10241,22145,-7543,7117
6
1300 DATA 6,-7287,10753,13432,282,20114,8814,46108
1310 DATA 6,88,-27707,11593,88,8708,17914,10684
1320 DATA 6,-320,9322,4,24832,56,30721,64615
1330 DATA 6,28672,8814,88,20085,17025,12854,87538
1340 DATA 6,-26624,21641,19073,26368,14,5366,45838
1350 DATA 6,-26624,21129,21313,26112,-10,5372,4729
2
1360 DATA 6,255,8713,21121,-7543,-7287,11585,26844
1370 DATA 6,88,20085,15745,-26624,21641,19073,5000
8
1380 DATA 6,26368,14,7578,-26624,21129,21313,49778
1390 DATA 6,26112,-10,20085,29188,8776,-11268,7288
3
1400 DATA 6,0,4,5136,5672,1,579,11392
1410 DATA 6,255,1091,1,24832,96,24832,51107
1420 DATA 6,60,5160,1,24832,178,5672,35903
1430 DATA 6,2,579,255,1091,1,24832,26760
1440 DATA 6,68,24832,32,5160,2,24832,54926
1450 DATA 6,150,5672,3,579,255,1091,7750
1460 DATA 6,1,24832,40,24832,4,20085,69794
1470 DATA 6,18663,20,17025,3093,255,26368,65424
1480 DATA 6,10,5853,21121,24576,-14,5781,57327
1490 DATA 6,21121,19679,10240,20085,18663,20,89808
1500 DATA 6,3091,255,26368,26,24832,30,54602
1510 DATA 6,18944,26368,10,6848,-10303,24576,66443
1520 DATA 6,-24,6875,24576,-30,6803,19679,57879
1530 DATA 6,10240,20085,9289,10315,17024,4098,7105
1
1540 DATA 6,17028,6145,6682,-17892,26112,10,38085
1550 DATA 6,21316,26112,-12,20085,21056,-20477,680
80
1560 DATA 6,25088,12,21316,-10812,10315,24576,7049
5
1570 DATA 6,-34,17024,20085,17384,4,6696,61159
1580 DATA 6,1,-17918,25344,20,29188,17028,53663
1590 DATA 6,17024,6146,4112,-26496,-6836,-11324,-1
7374
1600 DATA 6,20085,17028,17024,6184,1,4112,64434
1610 DATA 6,-26496,-6836,-11324,6696,2,-17918,-558
76
1620 DATA 6,25344,24,29187,17024,17028,6146,94753
1630 DATA 6,4136,1,-26496,-13828,3,-11324,-47508
1640 DATA 6,20085,17024,17028,4136,1,6184,64458
1650 DATA 6,2,-26496,-13828,3,-11324,29186,-22457
1660 DATA 6,17024,17028,4136,2,6146,-26496,17840
1670 DATA 1,-7348,-7348
1680 DATA 1,-11324,-11324
1690 DATA 1,20085,20085
1700 DATA -1
1710 REMark ** 4-character dictionary strings
1720 DATA "hich","here","tion","ment","ring","
","z"
1730 REMark ** 3-character dictionary strings
1740 DATA "ing","hat","the","air","his","ent"
1750 DATA "ion","ful","ear","est"
1760 DATA "out","are","ain","con","eat","ght"
1770 DATA "arm","ous","end","ine"
1780 DATA "ide","ane","ink","and","him","her"
1790 DATA "one","ate","der","pet"
1800 DATA "ans","urn","ack","uck","ock","for","bra
","ite","kin"
1810 DATA "ile","   ","ess","sub","ard","z"
1820 REMark ** 2-character dictionary strings
1830 DATA "th","is","on","in","ed","sh","es"
1840 DATA "ch","ou","st","ea","oo","en","us","or",
"ly","by","re","gh","at"
1850 DATA "er","em","to","of","oa","rn","sp","an",
"am"
1860 DATA "ar","op","al","nt","ie","me","ee","ll",
"ia","ui","rr"
1870 DATA "ma","ei","e ","r ","s ","d ","n "
1880 DATA "y ","a ","t ","pe","po","pi","pa","ta",
"rt","tr","sc","ab","be"
1890 DATA " w","qu","ga","gi","ck"," e","ru"
1900 DATA "ro","  ","ss","tt"," a","ho"," r"," s",
"go","do","z"
```

EXIT

The practical machine

A brave face was displayed by an industry afraid, at the PCW show.

The street traders of the business have learnt their lesson. Amstrad showed that expensive computers don't sell unless they are equipped with all necessary appendages. And now Atari makes the (obvious) point that there is more to a computer than the hardware – software makes the world go round.

The main event of the PC calendar – the PCW show – was dominated by Uncle Jack's Jackintosh, the Atari 520ST. Within weeks of receiving development machines dozens of software houses had either written new software or transferred packages written on the QL to what they think is this year's model.

On show on the Atari stand were business packages (for everyone from shopkeepers to solicitors) graphics software, communications, and, among many, the best game seen this year: the sci-fi animated adventure game called Brataccas, by Psygnosis out of Imagine. Brataccas should have seen light on the QL first – but that's another story.

The packed Atari stands had plenty of hardware on show too, including an elegant second disk drive system fitting underneath a new version monitor, and a prototype hard disk system. It's enough to make Sir Clive choke up a microdrive.

Not all the software was of the quality of Brataccas. The business packages had the look of 'first, but not the best'. That's to be expected from the bug-prone development system initially supplied. Nevertheless at its launch the 520ST is at a position which the QL took over a year to reach – a system with useable hardware, upgrades, and a strong software base. The ST works.

But Atari and Amstrad aside (of which more later) the show was a disappointing confirmation of the acute lack of investment by fearful hardware and software manufacturers. On the soft side, the show was over-run by mice, but anyone looking for this year's Visicalc was wasting his time. The dearth of new software is a symptom of reluctance to commission new projects, the increasing burden of piracy, or both.

But don't be too quick to complain. The most irrational industry is stabilising. Software houses, rather than flood the market with acres of identical plastic rubbish, are looking out for one or two excellent titles from first class professional programmers – the day of the amateur is over.

The Sinclair stand was a sad reflection on the company's (mis)fortunes. New hardware included CST's high-priced Winchester disk system and a Microperipherals 3.5" floppy drive under the Sinclair logo. There was no 128K Spectrum – that was launched in Spain two weeks later and won't be coming here for some time, in case any genius notices the price similarity to the QL. As to the software, suffice to quote a passing punter's comment typed onto the QL keyboard: 'If this is the new version software, why is it so slow?'

Commodore was coy about the Amiga. At the last minute the company changed its mind and, in a nearby hotel, showed a working version to the press while Metacomco exhibited the same, with a little more daring, in a suite in the exhibition hall. What Commodore wants all you computer buffs to do is buy the three-in-one C128 first. Meanwhile the Amiga waits in the sidelines stateside. Do we have the makings of another marketing disaster? The C128 looks suspiciously like the Plus 4 of 1985.

Amstrad, doubtless horrified to discover that their stand was adjacent to Atari acres, could console themselves that their machines are half the price, and just as good for half the potential applications. Alan Sugar, man-of-the-people, stood on the stand himself answering questions and shifting units. Amstrad is all simplicity: marketing; packaging; who cares for the bits as long as it works. Quite right too. The phenomenally cheap (but not nasty) Personal Computer Wordprocessor 8256 complete with keyboard, drive, monitor and NLQ printer, is testimony to the value of this philosophy.

Acorn, also aware that a machine must be shown to have support, gave over much of its stand to third party suppliers – apologies, robot suppliers – and succeeded only in giving the impression that the BBC is a box at the end of an umbilical cord.

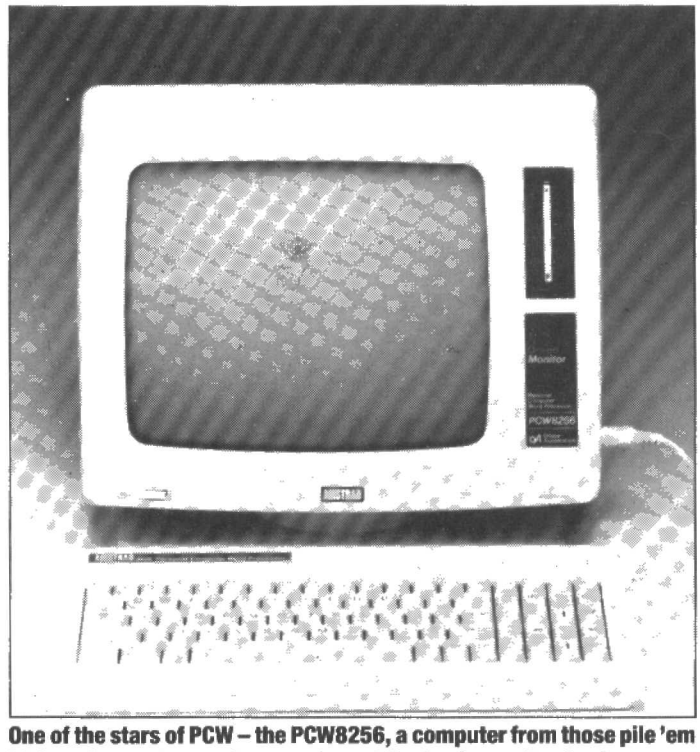
After its recent financial crises (note the use of the plural) one would have expected a display of confidence and dynamism from Acorn – a Communicator or BBC 'C' perhaps? Instead, the BBC B+ 128K machine was whipped off the shelf whilst everybody's back was turned (see news pages). It runs slower than the BBC B and doesn't run standard VIEW – definitely one for the specialist.

The Electron was on display again, confounding those who thought it had died last Christmas, bur frankly now that Dixon's are selling it for just under £100 including a data recorder and five Acornsoft programs, it has to be one of the computer bargains of the year.

'There was little to rave about at the show'

Anyone wanting to learn a little about Basic programming or play a few games (especially *Elite*) could do a lot worse.

PCW made it clear that the computer industry has kept a large following, even if those followers were given little to rave about this year. Most computer hardware, software and publishing companies are keeping heads down and looking to the business market to provide their bread and butter. This may have unfortunate long term effects: innovation has often come from the home sector rather than business. So for excitement we must settle for two new 68000 computers, one priced at £750 and one, probably, at between £1000 and £1500, both of which can walk on water blindfolded with their hands tied behind their backs. Dear oh dear how dull!



One of the stars of PCW – the PCW8256, a computer from those pile 'em high, sell 'em cheap, street traders of the business, Amstrad.

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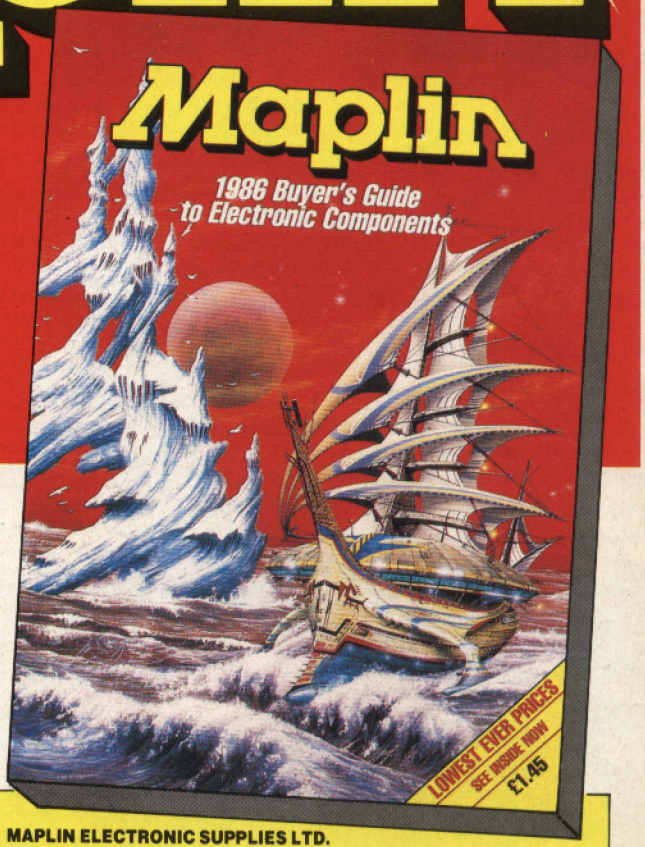

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